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ACCESSIBILITY MODIFICATIONS

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ACCESSIBILITY MODIFICATIONS

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barrier free environments, inc.

1976

guidelines for modifications to existing buildings for accessibility to the handicapped

special office for the handicapped

north carolina
department of insurance
commissioner john ingram

governor james e. holshouser

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note to owners of buildings

The application of building regulations by designers and owners should take into account the safety of all occupants including the physically handicapped. Elevators are usually incapacitated early in a fire, and they are not counted as means of egress. Since the physically handicapped need assistance to negotiate stairs in exiting a building, designers and owners of buildings should consider specially designed spaces for the physically handicapped on a level where an approved ramp to grade is provided so the handicapped may exit the building without assistance. If this is not possible, designers and owners should consider the normal use of the building while the physically handicapped occupy it to assure provisions for a sufficient number of able bodied persons readily available to assist the physically handicapped in the evacuation from such spaces down the stairs and other means of egress provided as exits in case of a fire or other emergency.

si conversion units

In view of present accepted practice in this technological area, U.S. customary units of measurement have been used in this report. It should be noted that the U.S. is a signatory to the General Conference on Weights and Measures which gave official status to the International System of Units (SI) in 1960. Readers interested in making use of the coherent system of SI units will find conversion factors in ASTM Standard Metric Practice Guide, ASTM Designation E380-72 (available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

Conversion factors for units used in this publication are:

Length:
1 in. = 2.540 cm
1 ft. = 30.480 cm

Weight:
1 lb. = 453.00 g

Temperature:
°C = 5/9 (Temperature °F - 32)

foreword

The provisions making new buildings and facilities accessible to and usable by the physically handicapped were adopted on March 13, 1973, by the North Carolina State Building Code Council and are found in *An Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code.*

To assist people in modifying existing buildings, guidelines derived from the handicapped section of the building code have been developed and presented in this new book, *Accessibility Modifications.*

This book has been produced by Barrier Free Environments, Inc. under contract with the Special Office for the Handicapped within the North Carolina Department of Insurance. This office has, as its primary responsibility, the implementation and interpretation of the Handicapped Section of the North Carolina Building Code and welcomes the questions and comments of those using both these books.

The information and illustrations in *Accessibility Modifications* are available for use to benefit handicapped people. Appropriate credit for their source is requested.

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introduction

The design of inaccessible buildings has been the only handicap to many disabled people who could otherwise live normal, productive, enjoyable, and useful lives.

Recent legislation including the "Handicapped Bill of Rights" found in the Appendix, and legal opinions have established the same rights of handicapped people to access to and use of all facilities afforded other people. This legislation and building code revisions have focused attention on making *new* buildings and facilities accessible to the handicapped to provide opportunities for education, employment, recreation, housing, medical care, and rehabilitation, and to otherwise protect the health, safety, and welfare of handicapped citizens of North Carolina.

However, the largest percentage of our existing buildings and facilities remain inaccessable. The emphasis today on extending the life of existing facilities means that the problem of accessibility to the handicapped and the subsequent denial of equal opportunities will be largely unaffected for many years unless existing buildings are modified so that they can be used by all.

Public officials and some building owners are recognizing their responsibility for making existing buildings accessible. *Accessibility Modifications* is a guide to assist them and others in identifying barriers in buildings, in visualizing design solutions to the problems, and in estimating the cost and practicality of modifications.

The basic assumption in considering any existing building for modification is that the needs of handicapped people are exactly the same as the needs of able-bodied people and, ideally, where facilities are available for the able-bodied, they should be so designed as to be available to the handicapped.

Modifications to buildings usually cost more than new construction because often something must be removed before the installation of the new facility. Thus, Cost of Modification = Cost of Removal + Cost of Addition. Often, however, minor changes or additions involving careful or thoughtful planning but little expense can make a building at least usable by handicapped people. In other situations, difficult problems may be prohibitively complicated and their expense, weighed against building life and function, may not be justifiable.

At this point one must try to establish some priorities for both *which* buildings and which *parts* of a building to modify. Variables of cost, use, policy, building type etc. make it very difficult to assign values to potential modifications. No one suggests that all facilities can be made accessible immediately, but certainly public facilities offering services and job or education opportunities to the public must be considered high on any priority scale. Therefore, although we address our attention primarily to institutional and public buildings, the same principles and philosophies apply to all buildings and, indeed, modifications to privately owned facilities can be good for business.

The companion problem of where to begin with a building once it has been chosen for modification is almost as difficult, but here some initial priorities usually surface. Getting into a building is equally important to those who wish to use its services as it is to those who work there, so parking and entrances are usually the first modifications. Since *using* the building is always the goal, access to the facilities must be included next. This may include vertical as well as horizontal circulation. Usable toilet rooms in an accessible part of the building might be the third consideration but often they may take precedence over vertical circulation. Each building will have different problems and requirements and will have to be treated individually.

This book is organized in three major sections:

I. Survey of Existing Buildings
II. Illustrated Guide To Modifications
III. Cost Anslysis

The Building Survey is intended to guide owners, administrators, and others through a building, its approaches and facilities, and to help identify the problem areas and evaluate potential modifications.

The Survey is cross-referenced to the Illustrated Guide where particular problems and recommended solutions are shown.

The Cost Analysis section offers information on possible costs by illustrating a recent accessibility modifications project and by reporting costs on each modification made. This section also is cross referenced to the Illustrated Guide where each of the modifications made are further explained.

SURVEY OF EXISTING BUILDINGS

LIBRARY

Wherever recommendations in this survey exceed the minimum building code requirement, they have been marked with the preferred ⧆ symbol.

SITE CONSIDERATIONS, pp. 1-5

1. Are there parking spaces at least 12′-6″ wide to allow car door to open fully so that a person with a wheelchair or other walking aid can get out?
If not, can such spaces be provided? See p. 2.

2. Are wide parking places located near each building or major facility entrance served by the lot so that a person will not have far to travel or have to negotiate between parked or moving cars? See p. 1.

3. If parallel parking is provided, are there spaces with at least 4′-0″ to one or both sides at the same level as the parking space?
If not, can such spaces be added? See p. 3.

4. Are there curbs or steps of any kind between parking area and building?
If so, can they be ramped? See p. 3.

5. Are there smooth, level, paved walkways at least 4′-0″ wide between parking areas and building?
If not, can they be added? See p. 4.

6. If slopes are steep, are there handrails on one or both sides?
If not, can they be added? See pp. 4, 32-33.

7. Are there hazards or obstructions such as chairs, posts, etc. along route?
If so, can they be removed?

8. Are there unpaved areas of gravel, sand, or stone which will obstruct wheelchair movement or hinder the use of walking aids?
If so, can they be paved? See p. 5.

ENTRANCE APPROACH, pp. 6-17

1. Is there any entrance to the building that is at grade level? If so, does the approach meet the requirements in Site Considerations? If so, is the rest of the building accessible from the grade level entrance? For example, if this entrance is at the basement level, is there an elevator to the floors above?
If a grade level entrance is at a level that does not allow access to the rest of the building, then the problem of interior changes in level must be considered (see pp. 28-35), or an entrance at another level must be found.

2. If no entrance is at grade level, then which entrance to the building is closest to grade level either up or down? See pp. 6-7.
Is there enough room to build a ramp to this entrance? See pp. 8-13.

3. If there is no existing entrance which can be successfully ramped, is there a location where the ground level is closer to the floor level where a ramp might be installed? See p. 16.
If so, is there a window at that location which could be made into a door?
If not, can a door be cut into the wall at that location? See p. 16.

4. Is it possible to install a lift to the entrance? See p. 14.

5. Is it possible to use earthworks to raise or lower the ground to the level of the entrance? See p. 10.

6. Is it possible to bridge to the building from another accessible building? See p. 15.

If there is no way to modify an entrance so that it does not have steps, then the building will not be accessible to an unaccompanied person in a wheelchair. However, other people may be able to enter, as can a person in a wheelchair with help, so consideration must still be given to making interior spaces accessible. Special consideration should be given to the toilet rooms and to those facilities which are the primary function of the building for both customers and employees.

DOORS, pp. 18-24

1. Are doors 2′-10″ wide or wider? See p. 18.
If not, is there another access to the space with a wider door?
If not, can the door be widened? See pp. 18-19.
If not, can a new door be cut into the space?
If not, you have an inaccessible space for many wheelchair people.

2. Does the door require more than 8 ⧆ pounds pressure to push or pull it open?
If so, can the door closer be adjusted? See p. 22.
If not, can the door closer be replaced with a new, light pressure one?
If not, can the existing closer be removed entirely and auxiliary handles be installed? See p. 24.

3. Is there enough space to the knob side of the door on the pull side to allow a wheelchair to pull to one side to open the door without backing?
If not, can such space be provided? See p. 21.
If not, can door closer be removed to make door easier to open and hold open?
If not, many wheelchair people will not be able to use the door.

4. Has the door a continuous, smooth surface at the bottom at least 10″ ⧆ high on the push side?
If not, can a kick plate be applied? See p. 22.

5. Do thresholds have vertical changes in level greater than ½″ ⧆?
If so, can they be replaced with new sloping thresholds? See p. 25.
If not, can an additional sloping surface be added to eliminate abrupt changes in level? See p. 25.

6. Is there a level, clear area at least 5′-0″ by 5′-0″ in front of the door on the pull side?
If not, can the existing area be expanded, or can such an area be added? See p. 22.

7. Is the floor on the push side of the door level and clear for a distance of at least 5′-0″ from the opening?
If not, can obstructions and/or changes in level be removed? See p. 21.

8. Are there double doors which swing in so that a person in a wheelchair could get caught between them?
If so, can one of the doors be removed? See p. 37.
If not, can both doors be made to swing out of the vestibule? See p. 37.

9. If the entrance door is a revolving door or has a turnstile, can it be replaced with a standard door, or can a standard door be installed adjacent to the revolving door or turnstile? See p. 23.

10. Do doors have latches which require operating a knob or handle? ⧆
If so, do knobs require grasping to turn?
If so, can lever handles be added so that latches can be operated easily? See pp. 24, 27.

FLOORS & HALLS, p. 26

1. Do floors have changes in level or thick mats or carpets which could trip a person or block wheelchairs?
If so, can such obstructions be removed? See p. 26.

2. Are hallways at least 3′-6″ wide?
If not, can walls be moved to make hallways 3′-6″ wide or wider?
If not, THAT'S TOO BAD!!!!!! Walls will get scraped and some people will scream and curse because they cannot turn around.

3. Are there wall-hung objects which protrude into the path of circulation which people with visual impairments might bump into because they cannot see them or locate them at the floor with a cane?
If so, can such objects be removed, raised, marked, etc.? See p. 26.

OPERATING MECHANISMS & CONTROLS, p. 27 ⧆

All kinds of knobs, handles, switches, dials, etc. may be difficult or impossible for some people to operate because of the type of movement and amount of force required, or because they are located too high or too far away. Consideration should be given so that they can be easily reached and operated by a single, non-precise movement.

1. Are switches and other controls mounted within easy reach of both seated and standing people?
If not, can they be moved? See p. 27.

2. If controls are too high for easy reach, does clear floor space allow close approach to the controls by wheelchairs?
If not, can obstructions be moved?

3. Are fire alarms and other emergency devices mounted no higher than 4′-0″ above floor?
If not, can they be lowered or new ones installed?

4. Are there public telephones in the building?
Are they within reach of a seated person?
If not, can one be lowered or a new one installed with all operating mechanisms no higher than 4′-0″ above the floor?
Are they equipped with volume controls? Are there tactile instructions?
If not, can a telephone with such equipment be installed?

CHANGES IN LEVEL, pp. 28-35

1. Are each of the floors in the building one level throughout?
If not, are there ramps to provide access between split levels, sunken or raised floor areas?
If not, is there space to install such ramps? See pp. 32-33, 13.
If not, could a small lift be installed? See p. 34.

2. Do existing ramps slope a maximum of 1 in 12, have handrails 2′-8″ high on both sides, and have a clear width of at least 4′-0″?
If not, can these be modified? See pp. 32-33.
If not, is there an alternate route for handicapped people to take to avoid the level change?

3. Are other levels of the building accessible by ramp or elevator?
If not, can a ramp or elevator be installed inside the building? See pp. 32-33, 28.
If not, can a ramp or elevator be installed outside the building? See pp. 8-11, 29, 30.
If not, can the building be connected to an adjacent accessible building by a bridge? See pp. 29, 15.

4. Do existing elevators have tactile markings next to call buttons, floor buttons, and at floor levels? ⧆

If not, can they be added? See p. 31.
If not, blind people will have great difficulty using the elevator and will require assistance.

5. Are existing elevator buttons and emergency call equipment located higher than 4′-6″ ⧆ above cab floor level?
If so, can they be lowered?
If not, can a wand or other aid to pushing high buttons be provided? See p. 31.
If not, wheelchair or short people will have great difficulty using the elevator and will require assistance.

6. Are there handrails in the elevator for support and balance? ⧆
If not, can they be added? See p. 31.
If not, some people may fall as car stops or starts.

7. Are there stairs which have flat and gently sloping risers and graspable handrails 2′-8″ high which extend 1′-6″ beyond the top and bottom of the stair?
If not, can the stair be modified as illustrated on p. 35?
If not, could an elevator or ramp substitute access for handicapped people to upper floors?
If not, you have a difficult and dangerous stair for handicapped people to use, or an inaccessible floor.

TOILET ROOMS, pp. 36-45

Toilet facilities are essential. Without accessible toilet facilities, handicapped people can use otherwise accessible buildings only for short periods of time.

1. Are there toilet rooms for men and women on each floor?
If not, are there toilet rooms on other floors which have elevator or ramp access without going outdoors?
If not, is there a closet, small room, or other space approximately 5′-0″ by 8′-0″ which could be made into a toilet room?
If not, can an elevator or ramp provide access to toilet rooms and other facilities on other floors?

Note: If no vertical circulation to upper floors is planned or is feasible, and all toilet rooms are on those upper floors, and no toilet room can be added on lower accessible floor, consideration should still be given to making toilet rooms and other facilities on upper floors accessible because people with braces, crutches, and walkers can climb stairs and require many of the same features such as grab bars in stalls, etc. Also, people in wheelchairs can attend classes or hold jobs on upper floors if they can get assistance up and remain there during regular hours, but they must have the necessary toilet facilities. Information on the location of accessible toilet rooms should be given at all toilet rooms.

2. If toilet rooms are located on each floor:
Are doors into and out of toilet rooms 2′-10″ wide or wider?
If not, can they be widened? See p. 18.
If not, can a new wider door be installed elsewhere to provide access to the room?

3. Are there double door vestibules into toilet rooms?
If so, can second door be removed? See p. 37.
If not, can both doors swing out of the vestibule? See p. 37.

4. Is there a privacy screen less than 3′-6″ from the entrance door?
If so, can it be moved to 3′-6″ or farther from the entrance door, or can it be removed? See p. 36.

5. Can a wheelchair turn around in the toilet room so as not to have to back out?
Is there enough room for a wheelchair to approach the fixtures? See pp. 38-39.

6. Is there a threshold or step at toilet room entry which rises more than ½″ ⧆?
If so, can it be removed or replaced by a new sloping threshold to meet floor level? See p. 25.

7. Is there enough space now, or could there be enough space by removing existing stall and equipment, to install a recommended 5′-0″ by 5′-0″ stall? See p. 41.
If not, can an existing stall be changed to a 5′-0″ by 5′-0″ or 3′-0″ by 6′-0″ stall? See p. 41.
If not, can a new space be constructed which will permit the transfer methods shown on p. 40?

8. Are bottoms of mirrors, operating mechanisms, towel dispensers, coin slots, etc. no higher from the floor than 3′-4″?
If not, could they be lowered or could new ones be installed? See pp. 42, 45.

9. Is there a 2′-6″ ⧆ high clear knee space below apron of lavatories to allow wheelchair person to pull up under lavatory?
If not, can sink be raised to provide such space or can a new lavatory be installed? See p. 42.

10. Would a wheelchair person's legs touch hot pipes under sink and be burned or injured?
If so, can pipes be moved?
If not, can pipes be insulated, padded or boxed in? See p. 43.
If not, can water temperature be reduced to not more than 120°?

SEATING FOR ASSEMBLY, p. 46

1. Are there one or more spaces approximately 2′-6″ wide and 4′-0″ long within view of all activities where a wheelchair person can park?
If not, can some seats be moved or removed to provide such a space? See p. 46.

2. Are there seats with clear space in front for people with walkers or long braces and crutches?

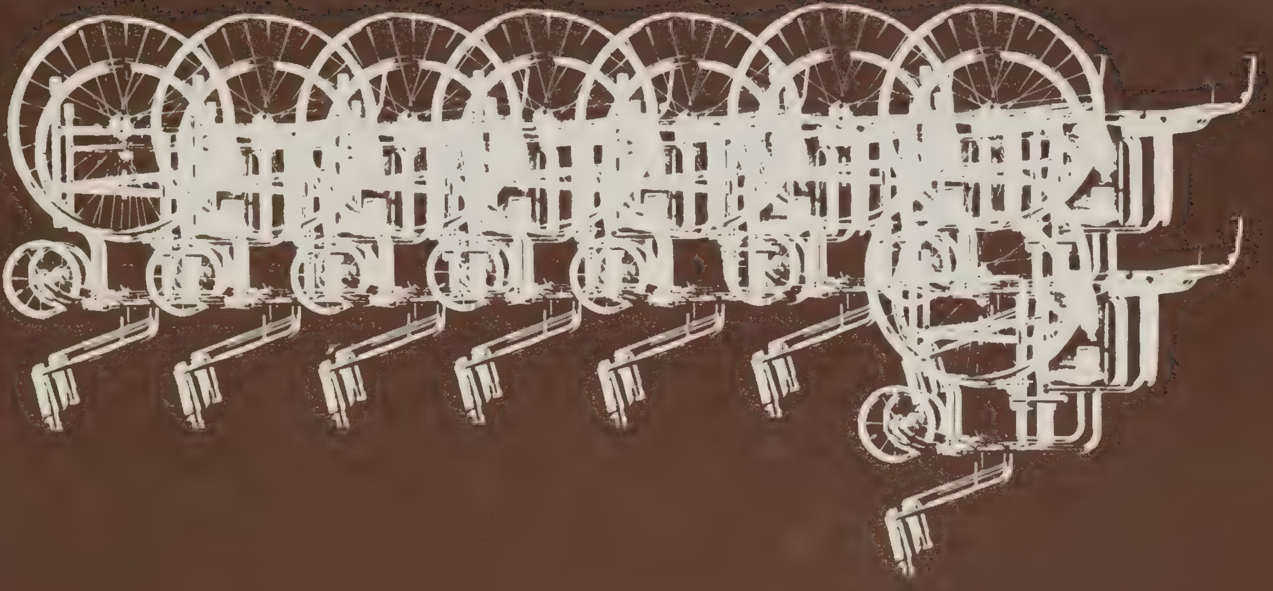
3. Are circulation spaces between fixed furniture and equipment 3′-0″ or greater?
If not, can they be moved?

4. Is there 2′-6″ ⧆ clearance under some tables or work surfaces?
If not, can they be raised?

WATER FOUNTAINS, p. 47

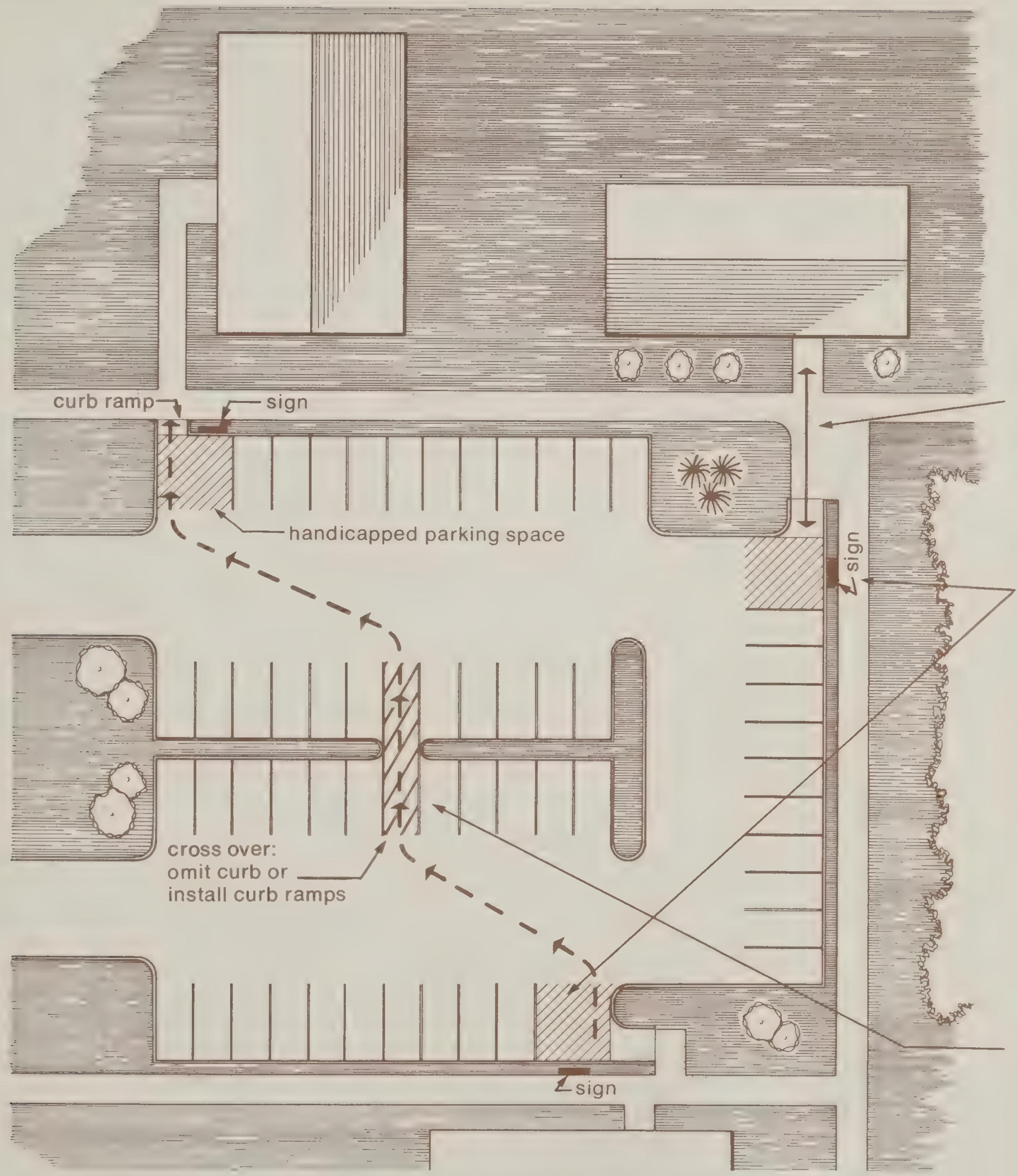
1. Are there water fountains with spouts no higher than 2′-10″ from the floor?
If not, can one on each floor be lowered?
If not, can a new one be installed, or a side-mounted one be added to an existing one with spout at 2′-6″ to 2′-10″ above floor? See p. 47.
If not, can a paper cup dispenser be installed 3′-4″ above the floor? See p. 47.

Please note: If answering these questions is difficult, perhaps a better way of deciding what needs to be changed is to borrow or rent a standard wheelchair, sit in it in your parking area, and see if you can get in and out of a car from it. Then try entering the building. Then try to do each of the things which people normally do in your building. Or ask a handicapped person to do it for you. The problem areas will become apparent.



ILLUSTRATED GUIDE
TO MODIFICATIONS

site considerations
parking



If curbs surround parking areas, curb ramps are essential. See p. 3.

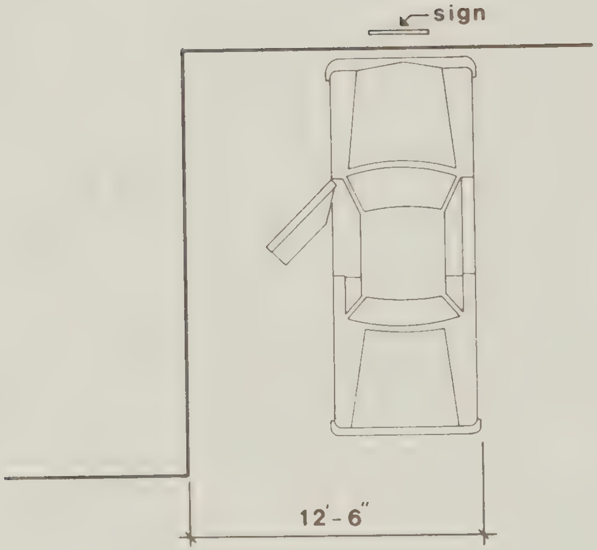
Handicapped people move more slowly than able-bodied people, and some cannot travel great distances. Therefore, it is preferred that some designated parking spaces be located as close as possible to accessible building entrances.

Parking spaces for the handicapped should be distributed throughout a parking layout to provide a choice of locations and the shortest travel distance to each major facility entrance.

Route of travel from designated parking spaces to buildings should not require persons to move in vehicle circulation paths. Careful location of curb ramps or elimination of curbs and pedestrian crosswalks is essential.

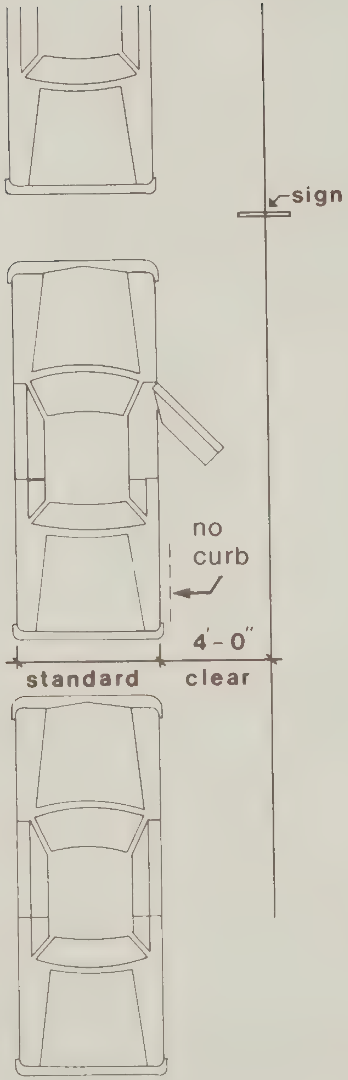
Divider islands in parking areas should not become barriers. Omit curbs or provide curb ramps where pedestrian cross circulation is required.

site considerations
parking

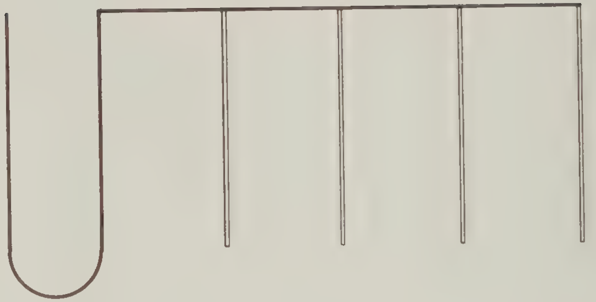


Parking spaces for handicapped persons must be 12'-6" wide to allow opening of doors fully for loading and unloading wheelchairs, and must have above ground sign $\boxed{*}$ designating the space for the handicapped only.

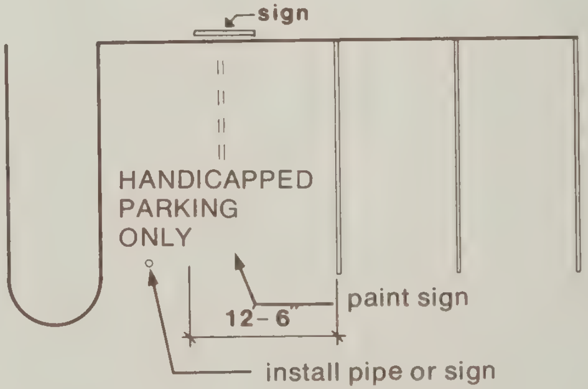
A painted sign on the pavement is also recommended in addition to the above ground sign.



Parallel parking may also be used, provided at least 4'-0" clear space to side is available *at same level as the parking space.* Some such spaces should be on the driver's side and some on the passenger side.



In existing parking lots, it may be less costly to sacrifice two regular parking spaces to make one handicapped space.

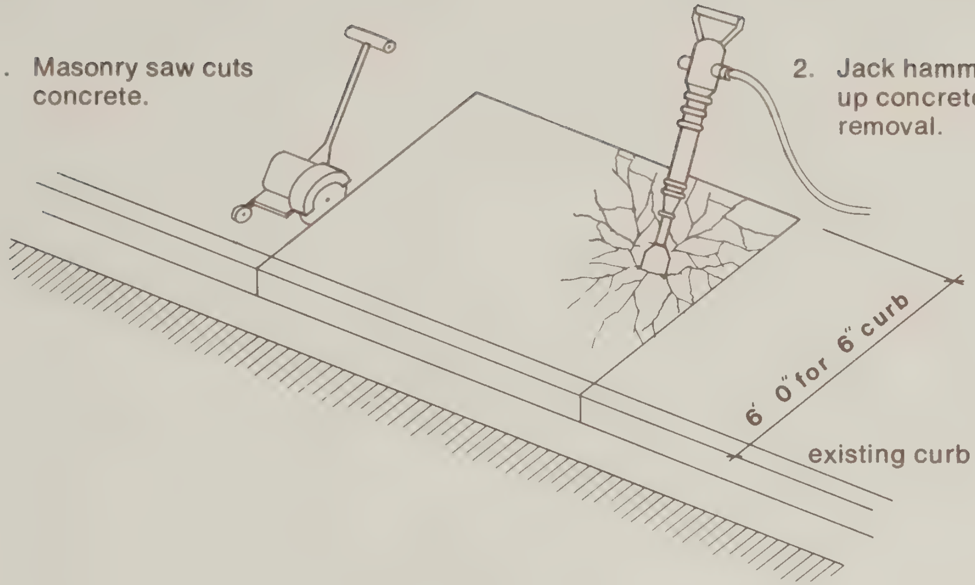


install pipe or sign or curb to prevent entry of second vehicle into space

curb ramps

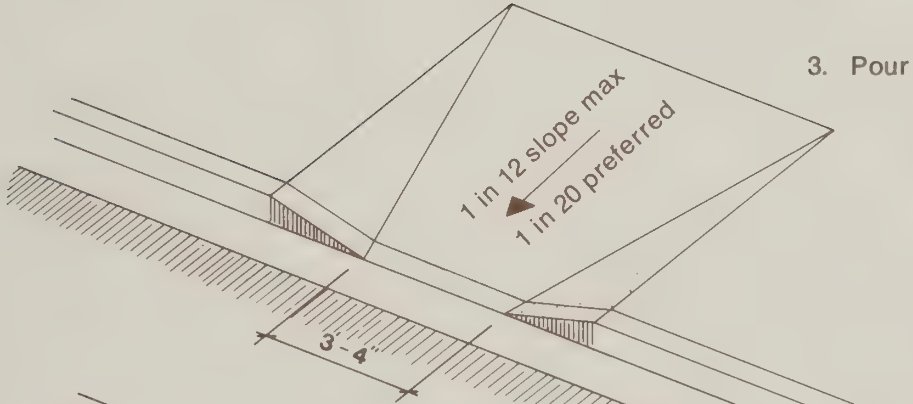
1. Masonry saw cuts concrete.

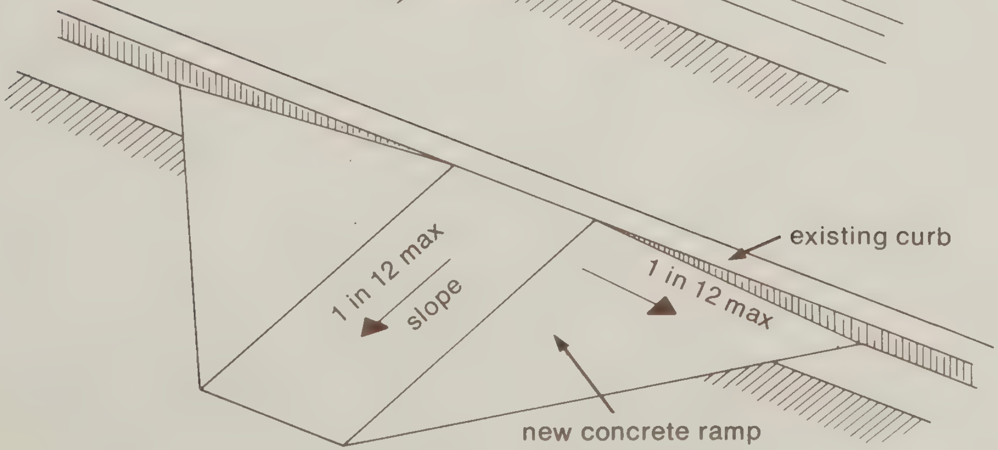
2. Jack hammer to break up concrete for removal.



Existing curbs can be removed and new concrete poured for curb ramps. Maximum slope on any surface should not exceed 1 in 12 or 1 in 20 if possible. See also North Carolina Department of Transportation, Division of Highways, Highway Design Branch, *Guidelines: Curb Cuts and Ramps for Handicapped Persons.*

3. Pour new concrete ramp.





Ramps, such as the one shown here, poured out into the street are less desirable due to interference with traffic and gutter drainage problems but may be less costly and could be used in areas where little or no traffic flows and where slope of street eliminates need for continuous gutter.

Note: Sides of this type of ramp must flare gently at 1 in 12 maximum slope.

site considerations
route of travel

Route of travel from parking spaces to buildings should provide:

1. Curb ramps at points of pedestrian flow.

2. Smooth, hard, clean, slip-resistant surface with no abrupt change in level of more than ½″.

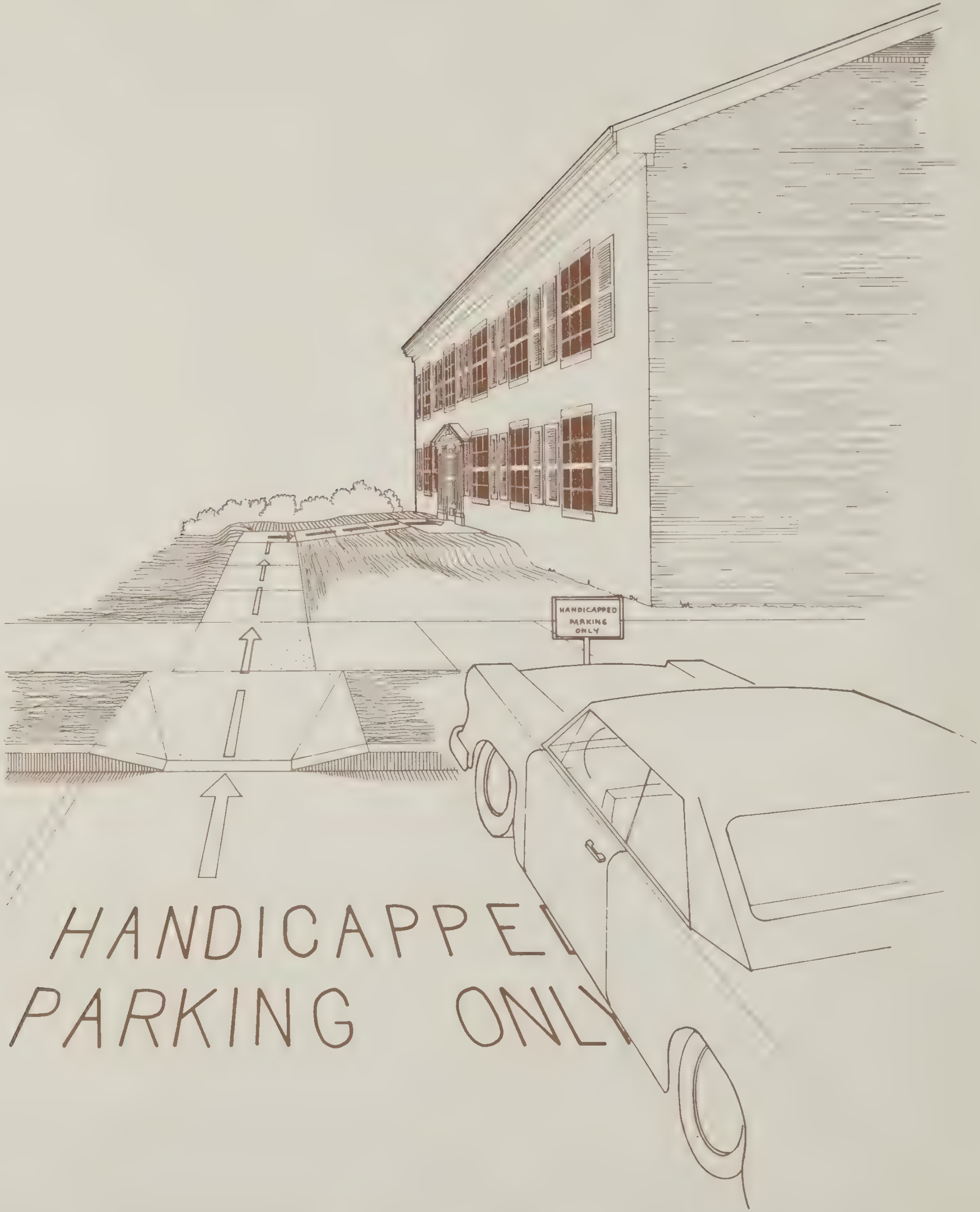
3. 4′-0″ minimum width.

4. No hazards such as low chains, posts, or low overhanging objects such as signs.

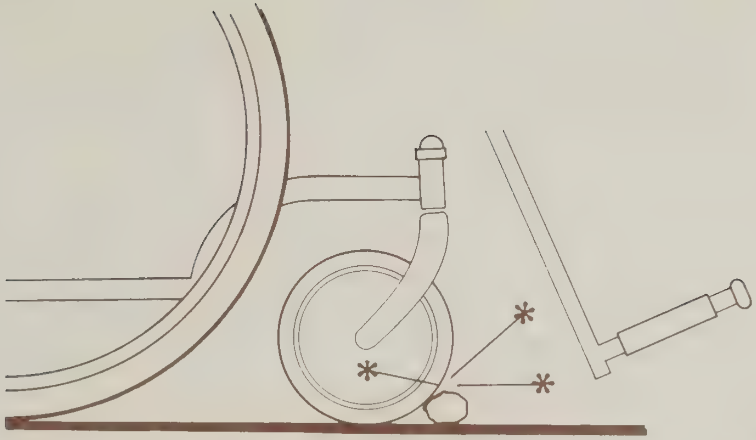
5. Gradual slopes, if any.

6. Handrails at steep slopes.

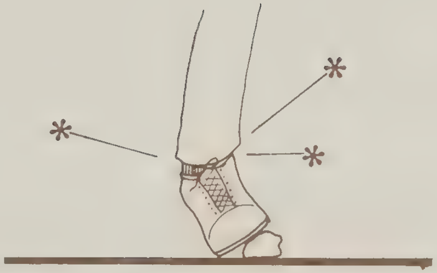
7. Places to rest where distances are great.



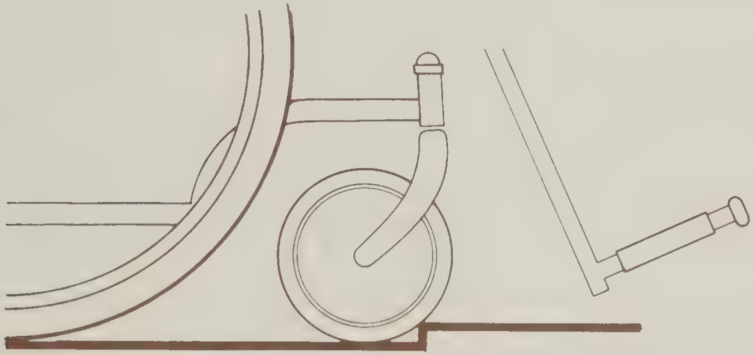
Walks must be smooth and hard surfaced. Loose gravel, stone, sand, or similar soft materials make use by wheelchairs and crutches extremely difficult or impossible.



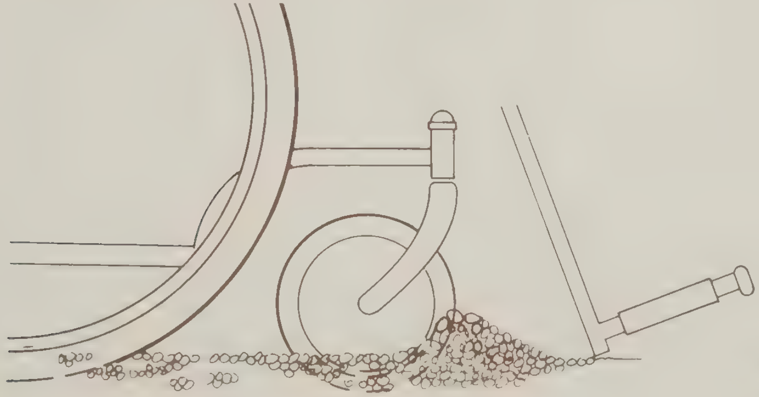
Stones and other objects on walks will jam and stop wheelchairs,



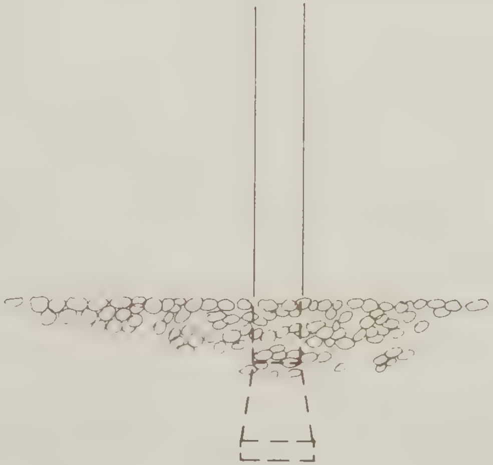
and cause twisted ankles and falls.



Abrupt changes in level or unevenness of surface greater than ½″ $\boxed{*}$ are also obstacles.



Soft, loose gravel or sand will allow wheelchairs and crutches to sink in and make progress impossible.



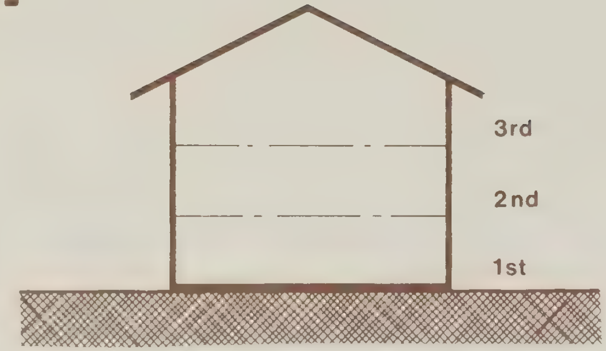
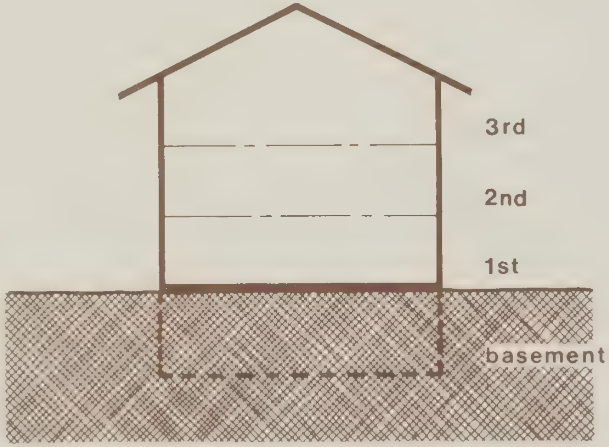
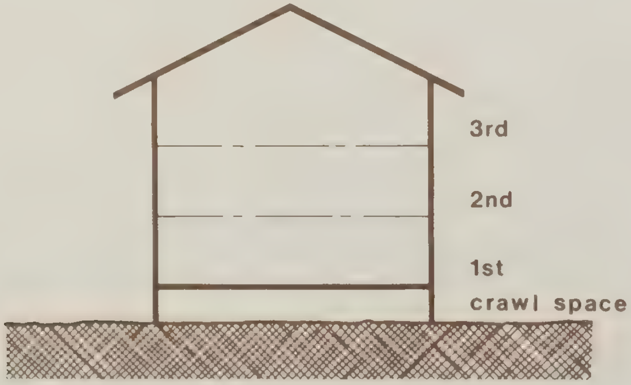
entrance approach building level types

Entrance to buildings becomes difficult for handicapped people when the entrance floor level is other than at, or near, ground level.

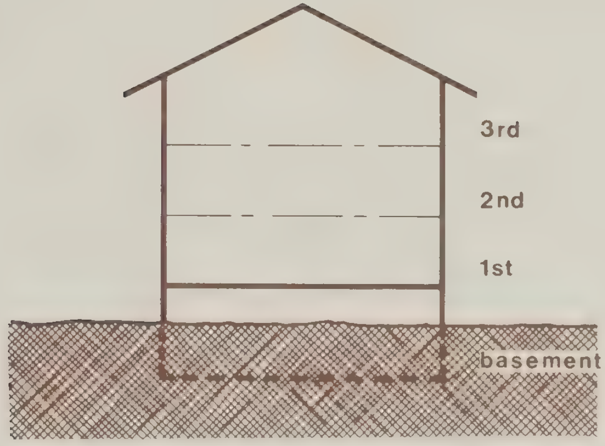
Most handicapped people require smooth, flat or gradually sloping surfaces to reach entrance floor levels.

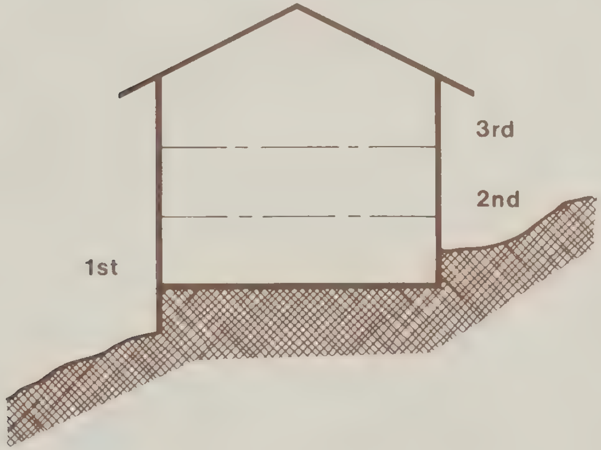
Existing buildings usually have entrance floor levels above or below ground level so that modifications for access will require installation of ramps, bridges, mechanical lifts, or changes in the shape of the land to provide a smooth, gradually sloped surface.

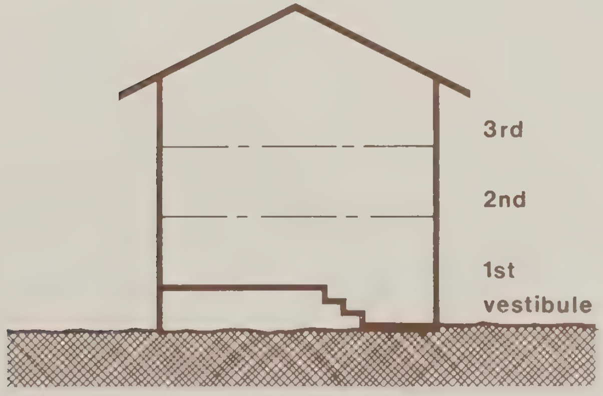
Building floor level types are diagrammed at right. On the following pages, some typical entrance conditions for these building types are illustrated with recommended design solutions which will meet or exceed the N.C. Building Code requirements for the handicapped.

	DESCRIPTION	MODIFICATIONS
	Building with first floor at ground level. Other floors, if any: above. No Basement.	Will require minimal alteration to provide entrance access.
	Building with first floor at grade level. Basement: Below grade.	Will require minimal alteration to provide entrance access.
	Building with first floor and other floors above ground level. Crawl space, no basement.	Will require installation of ramp or bridge or change in shape of land to provide access. See pages 8-16.

entrance approach
building level types





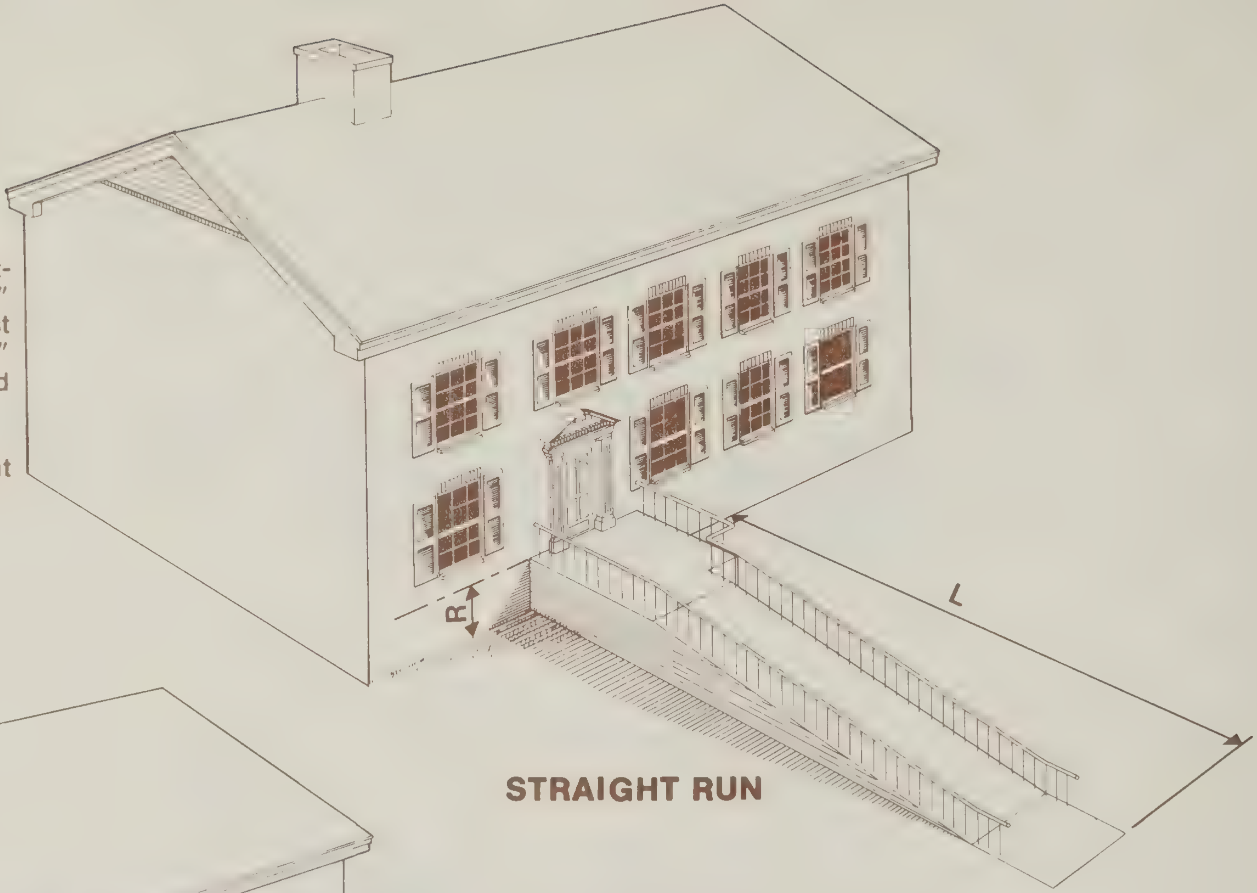


DESCRIPTION	MODIFICATIONS
Building with first floor above ground, and basement floor below ground level.	Will require installation of ramp or bridge or change in shape of land to provide access to first floor or basement. See pages 8-16.
Building with first floor above and below grade on sloping site.	Will require installation of ramp or change in shape of land for access to first floor, or bridge for access to second floor. See pages 8-16.
Building with first floor above grade with interior split level vestibule. Note: This type of entrance is the most difficult to modify for accessibility, see p. 12.	Will usually require raising portion of vestibule floor up to main floor level, raising door, and adding ramp, bridge, lift, or earthwork to provide accessibility. If recommendations p. 12 cannot be implemented, try locating another accessible entrance elsewhere, see p. 16.

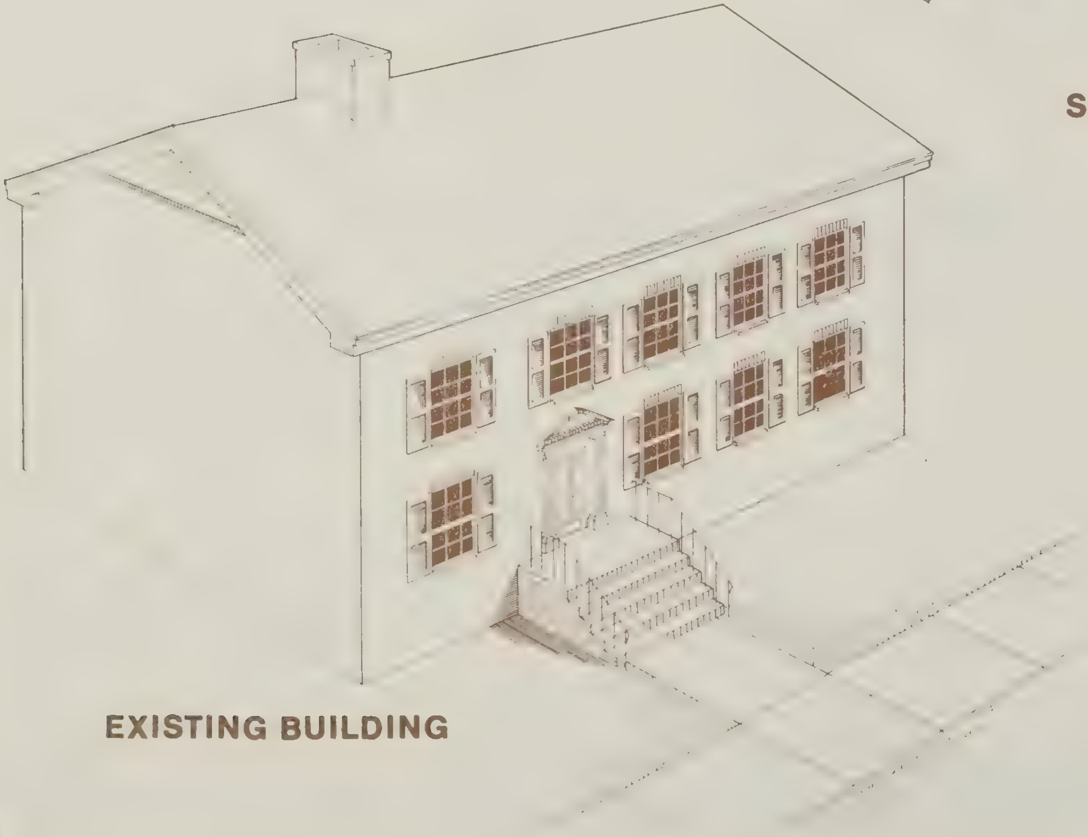
entrance approach ramps

Ramps must have 5′-0″ x 5′-0″ level platforms at top and bottom, must be at least 4′-0″ wide, must not exceed 1 in 12 slope, must have handrails on both sides that are 2′-8″ high and extend 1′-6″ ✱ beyond top and bottom of ramp.

Surfaces of ramps must be slip-resistant materials.



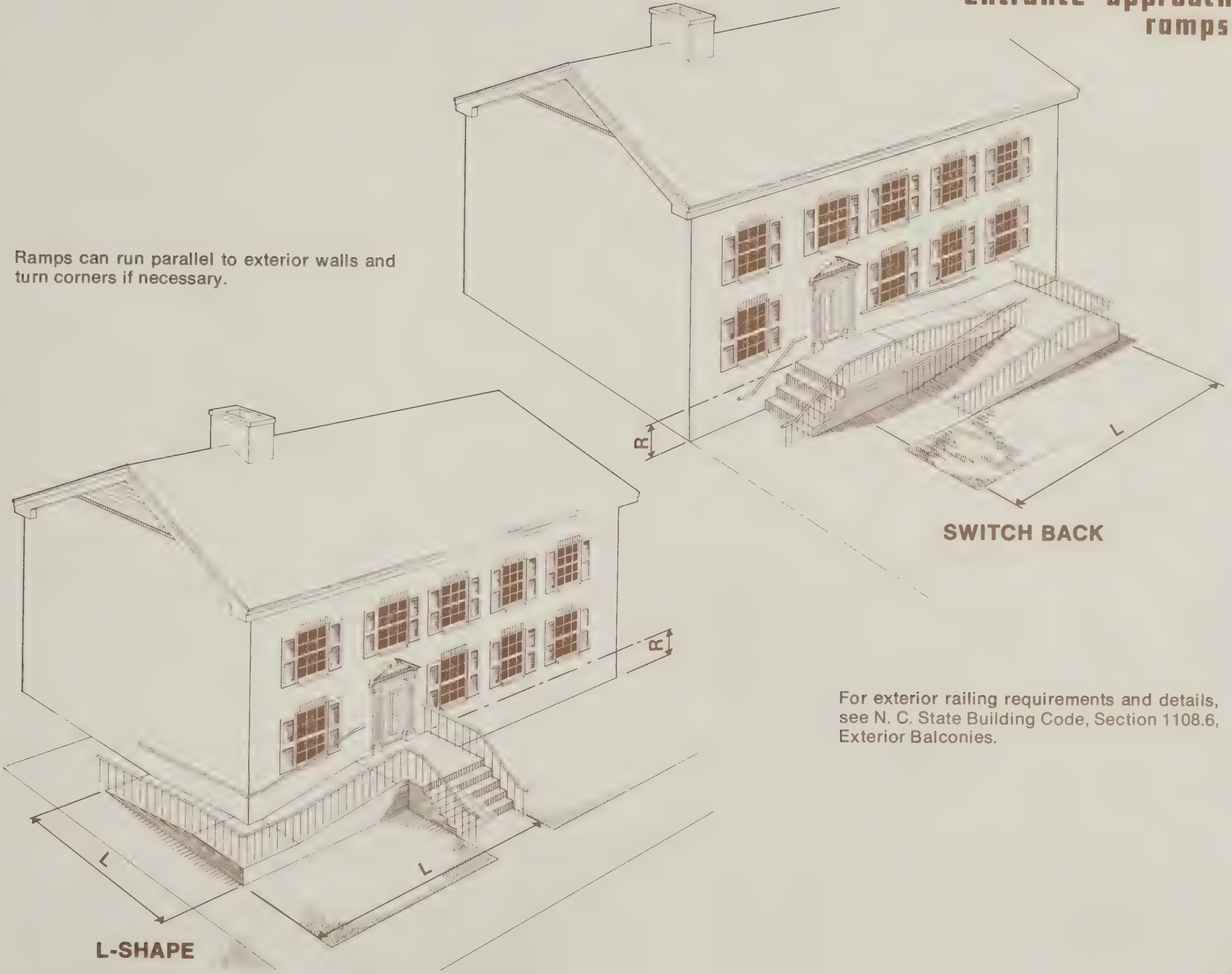
STRAIGHT RUN



EXISTING BUILDING

See tables on page 13 for space requirements for ramps of known floor elevation (R) above ground. For additional information on ramps, see pp. 32-33.

Ramps can run parallel to exterior walls and turn corners if necessary.



SWITCH BACK

L-SHAPE

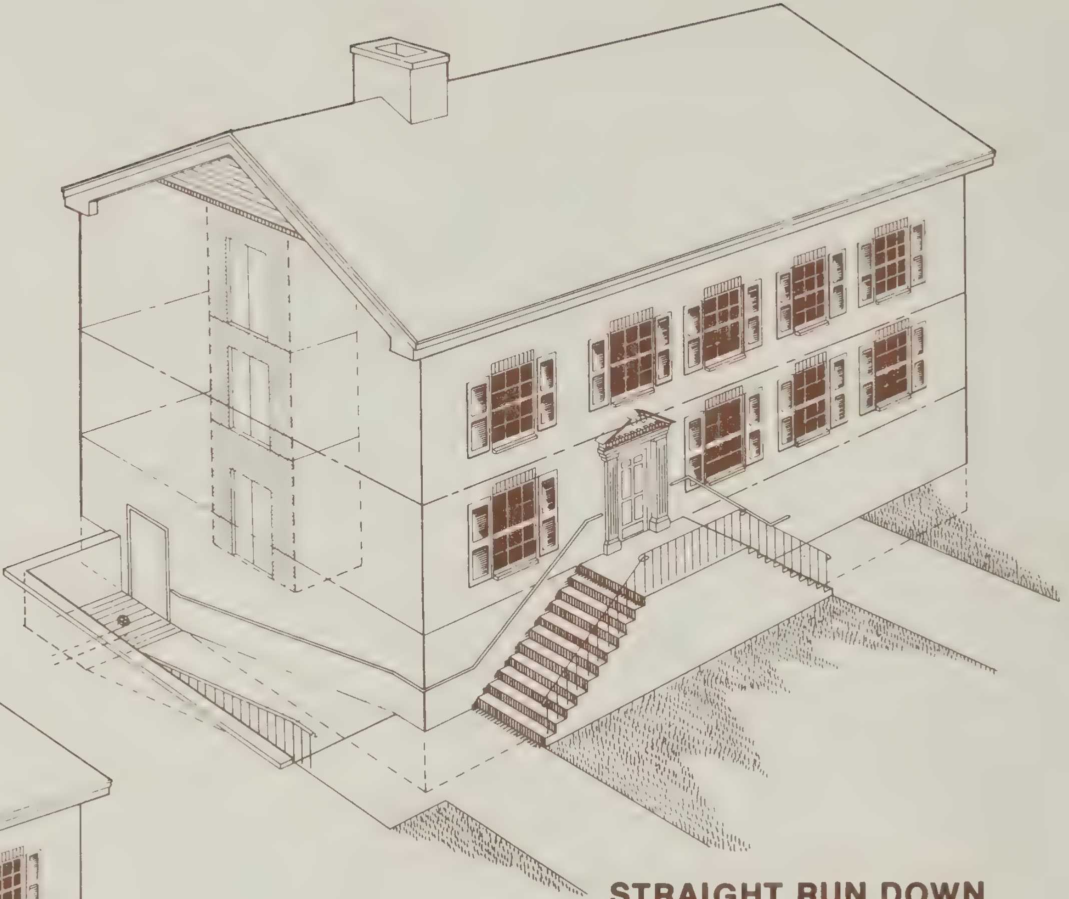
For exterior railing requirements and details, see N. C. State Building Code, Section 1108.6, Exterior Balconies.

entrance approach ramps

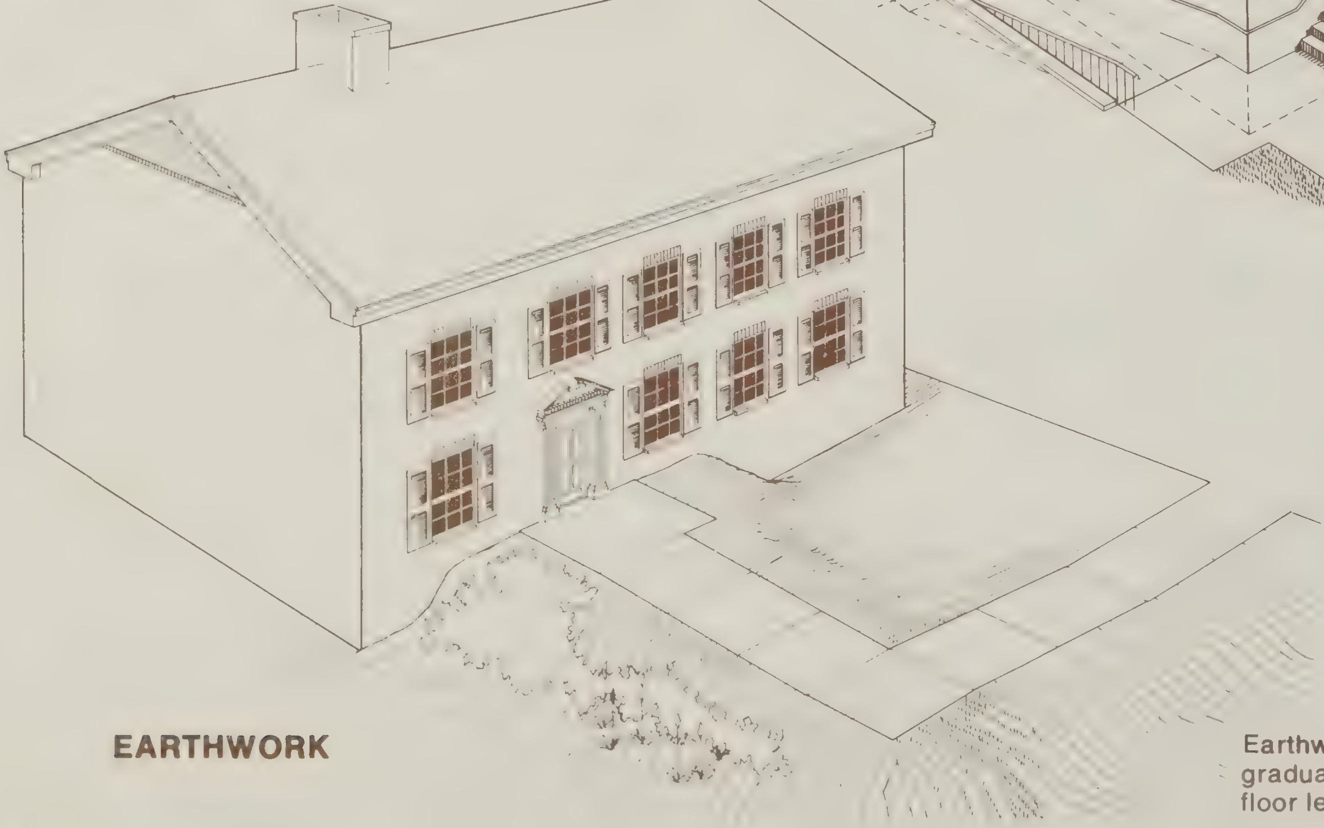
When distance from main floor to ground is greater than distance from ground level to basement floor, it may be more economical to put ramps in below ground level to provide access to lower level. Building must have means of vertical transportation such as elevators.

Ramps below ground can have exactly the same configurations as ramps above ground level. See page 13.

Entrance doors and platforms below ground level must meet all requirements for entrances and must have adequate provisions for drainage.



STRAIGHT RUN DOWN

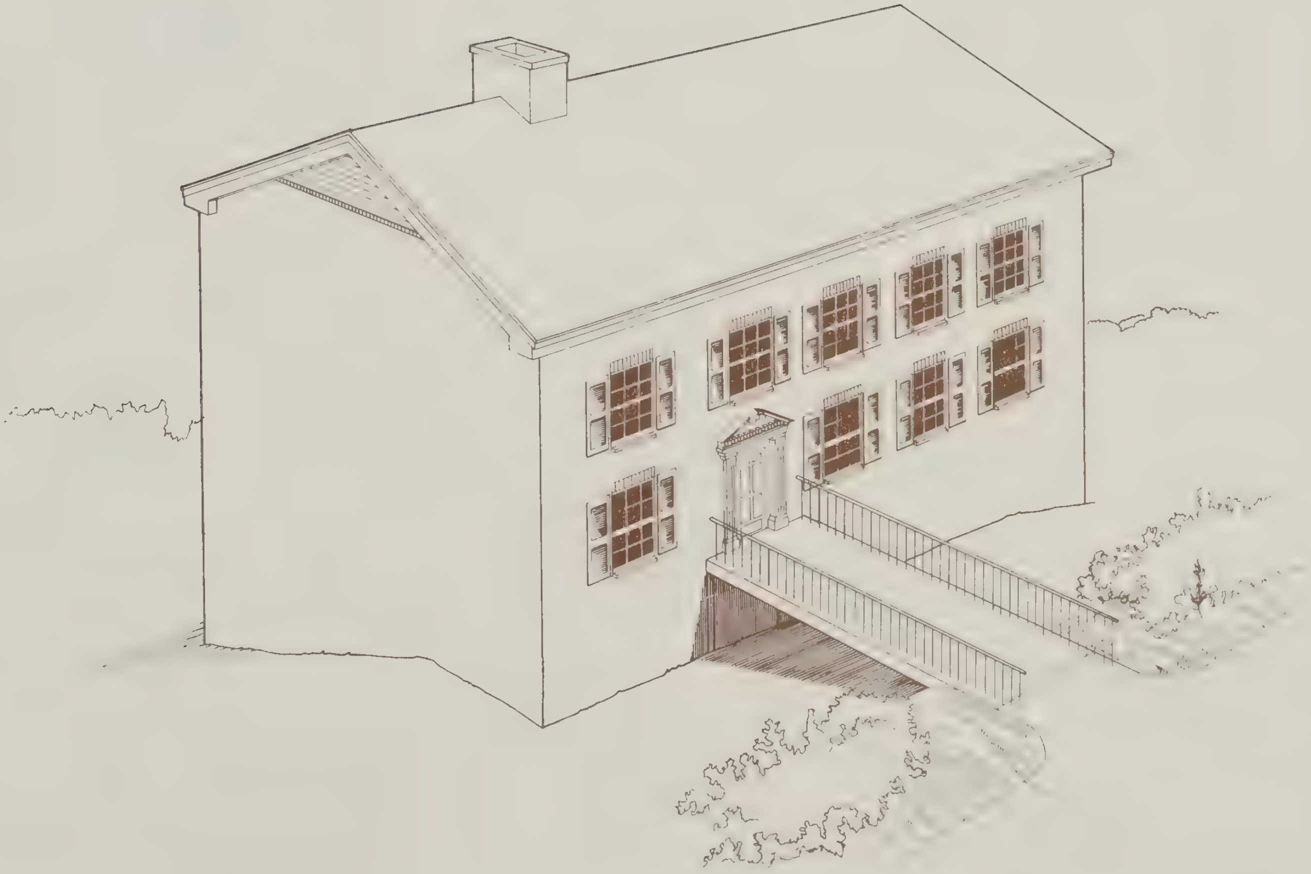


EARTHWORK

Earthwork can be used to provide smooth, gradually sloping approaches to entrance floor levels.

entrance approach bridges

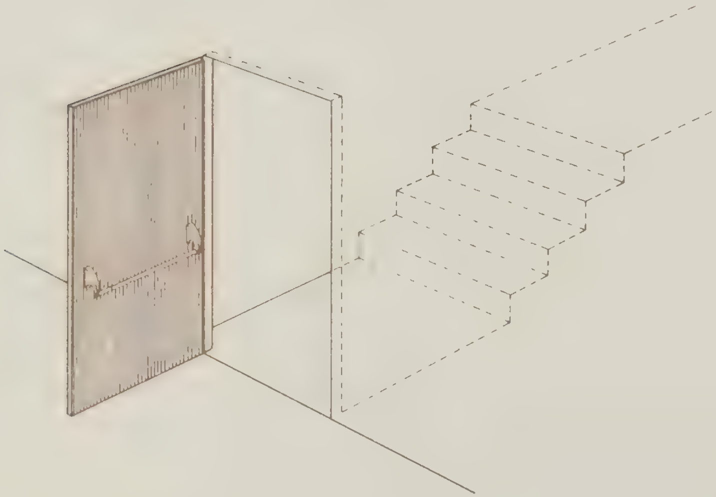
On steeply sloping sites bridges might be used to connect floor levels to accessible site locations on the uphill side.

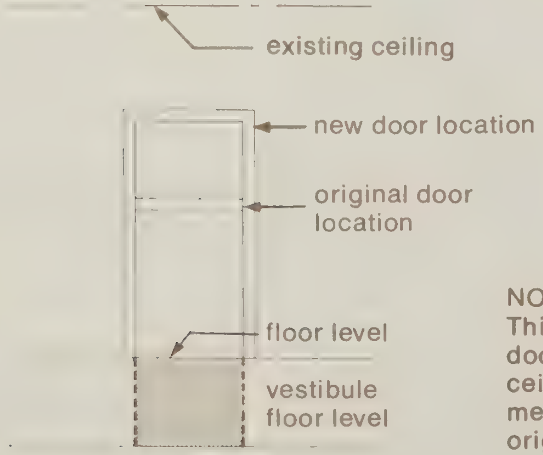


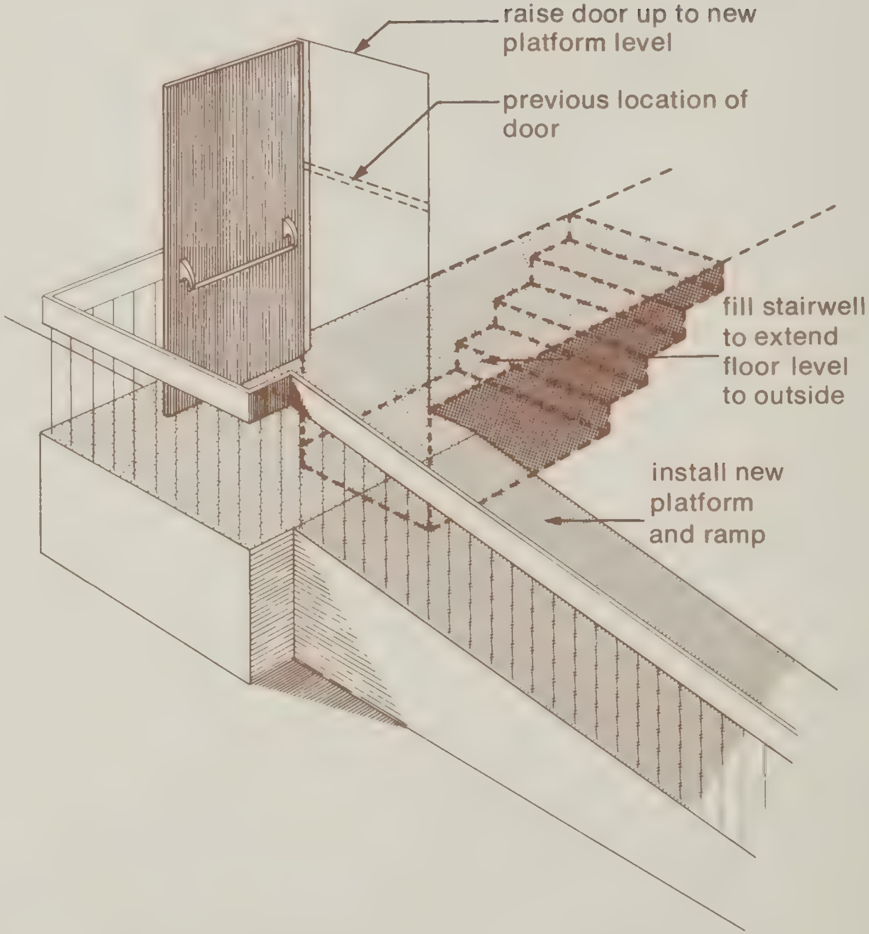
entrance approach
split level vestibule

Entrances which have an interior vestibule floor with steps up to entry floor level can be difficult to modify for accessibility due to lack of space inside for ramp to be installed.

Such entrances could be made accessible by filling the stairwell to extend floor level to exterior where a new level platform and ramp could be installed. Platforms must be at least 5′-0″ x 5′-0″, with 1′-6″ [*] clear to pull side of door.

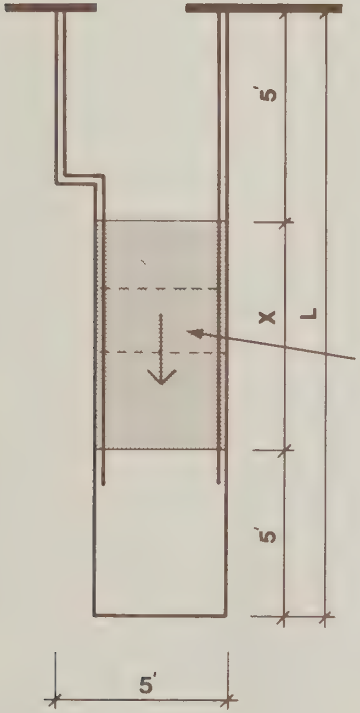




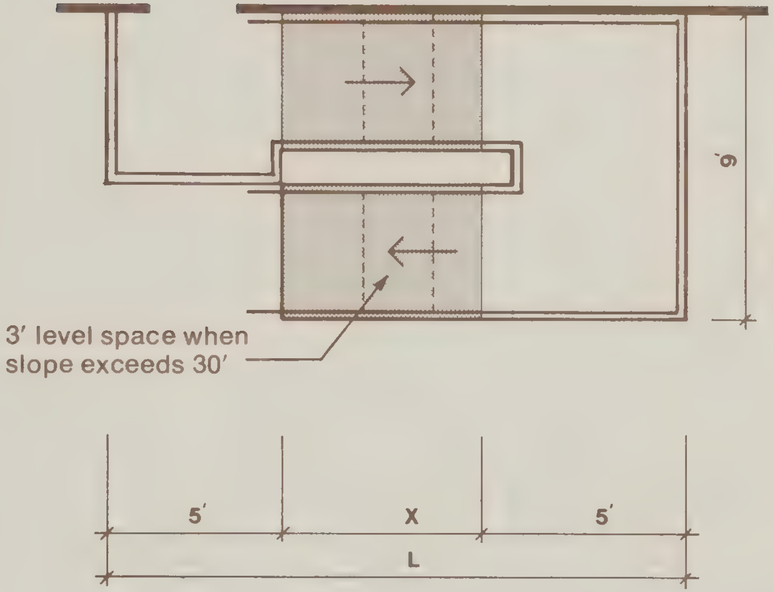

raise door up to new platform level
previous location of door
fill stairwell to extend floor level to outside
install new platform and ramp

NOTE:
This method is dependent upon raising the door up to floor level. There must be sufficient ceiling height and any structural members or mechanical equipment in the wall over the original door may have to be moved.

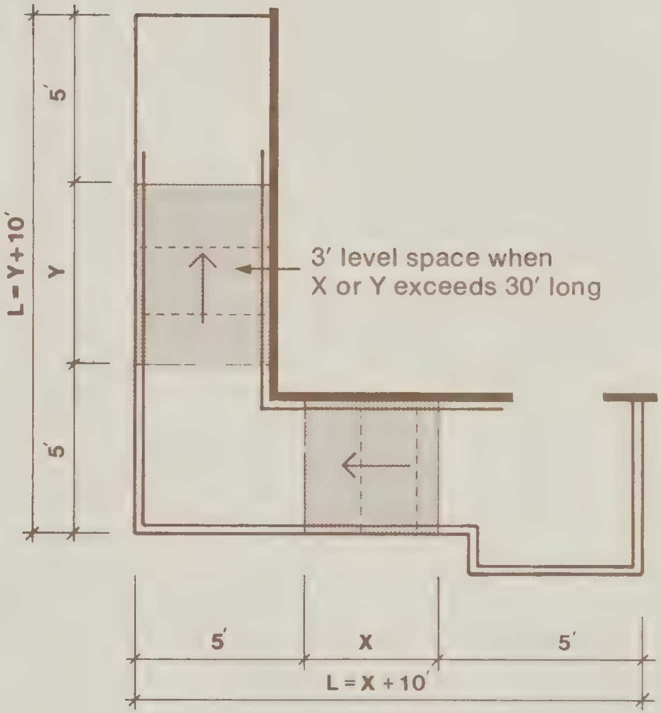
STRAIGHT RUN



SWITCH BACK RAMP EQUAL RUN



L-SHAPE



R	1′	2′	3′	4′	5′	6′
X	12′	24′	39′	51′	63′	75′
L	22′	34′	49′	61′	73′	85′

R	1′	2′	3′	4′	5′	6′
X	6′	12′	18′	24′	30′	39′
L	16′	22′	28′	34′	40′	49′

R	1′	2′	3′	4′	5′	6′
X + Y	12′	24′	36′	48′	60′	75′
			39′	51′	63′	78′

Note: Tables assume flat sites and 1 in 12 slopes.
Sites which slope may require longer or shorter ramps depending on direction of ramp and slope of site. Ramps should be oriented to minimize their length.

Wherever possible the length of the slope of ramps should be evenly divided.

L = total length of ramp
R = rise
X and Y = length of the slope

Whenever either X or Y exceeds 30′ add 3′ for rest area.

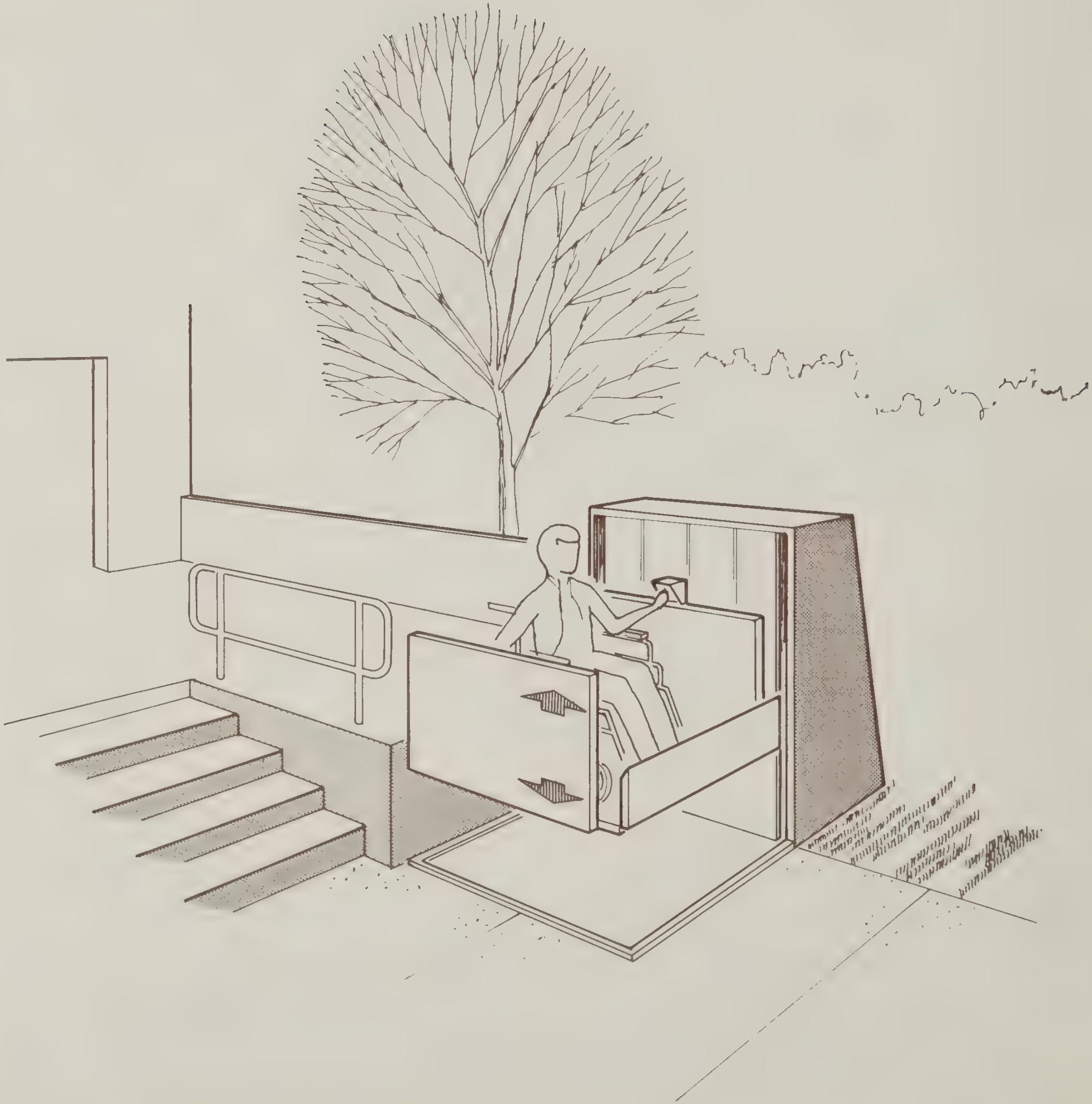
entrance approach lifts

There are a number of mechanical wheelchair lifts available which are weatherproof for permanent outdoor installation. These lifts are electrically, hydraulically or pneumatically operated and can rise several feet.

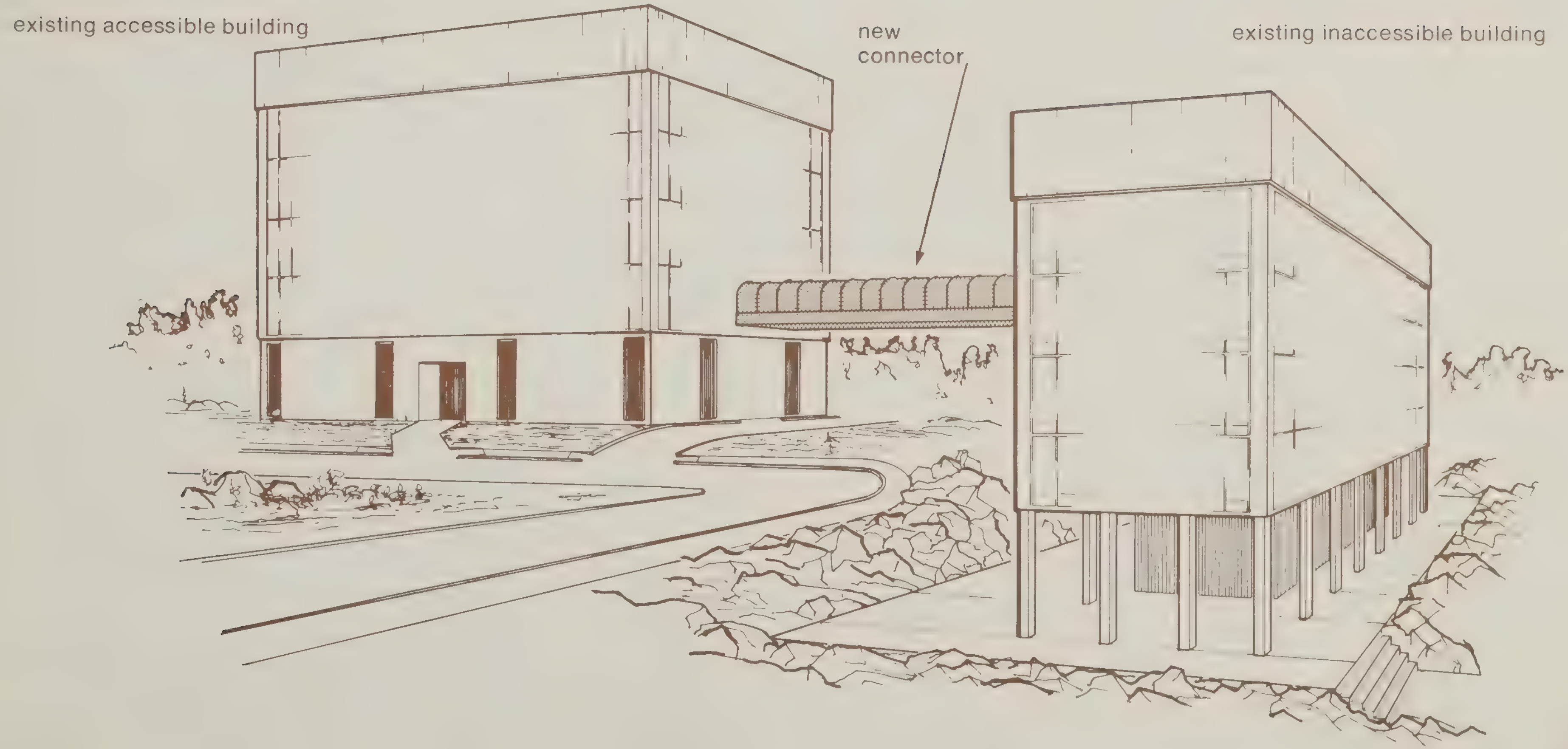
Such lifts could offer an economical and space-saving solution to the problem of accessibility to existing buildings.

At this time the available lifts of this type cannot be used in North Carolina for public buildings, but may be used in private residences.

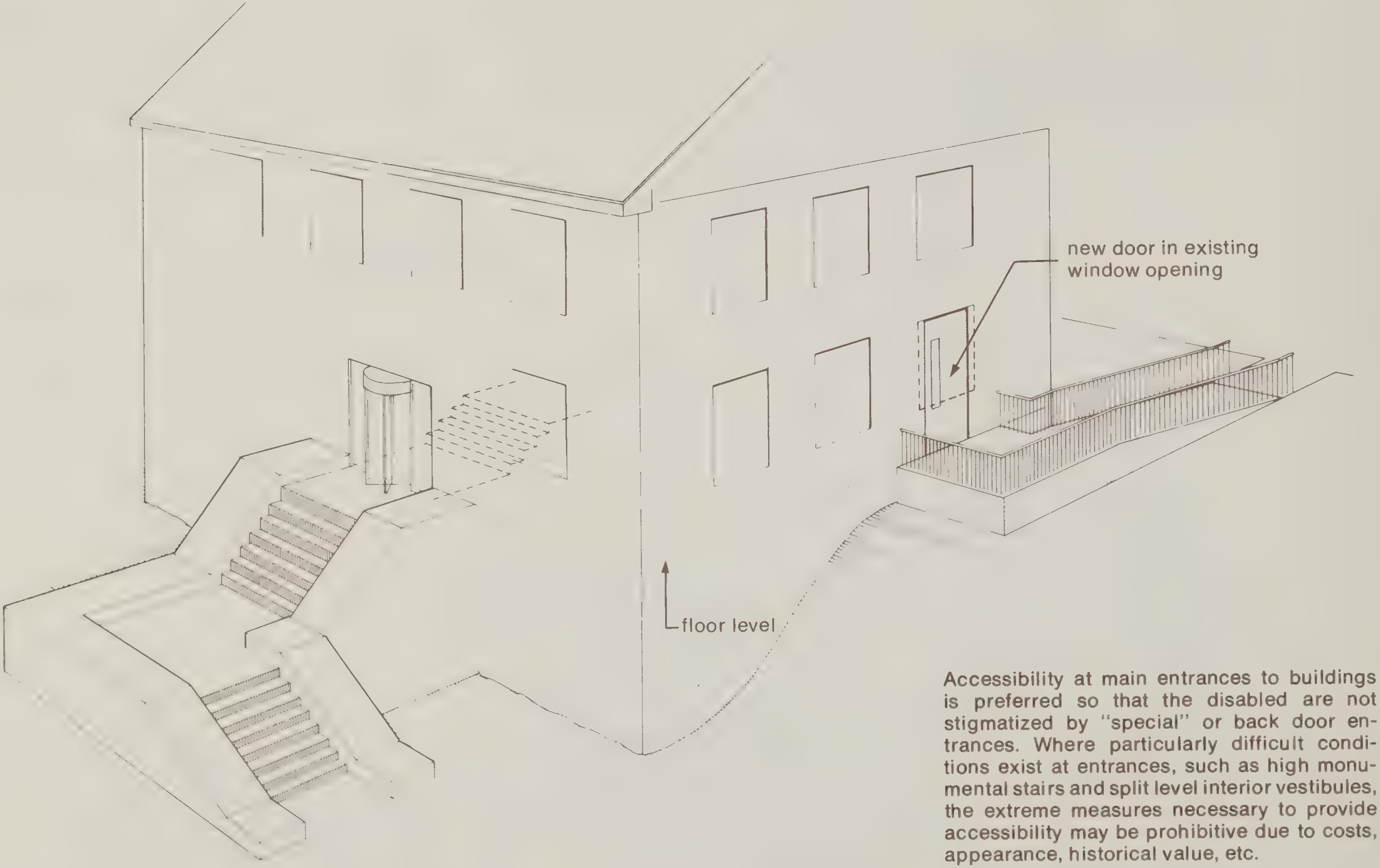
Additional information about elevators and lifts may be obtained from the Elevator Division, N.C. Department of Labor.



In some cases it may be possible to utilize existing accessible facilities to provide access to nearby inaccessible buildings by connecting the two with enclosed overhead bridges.



entrance approach
location of entrances



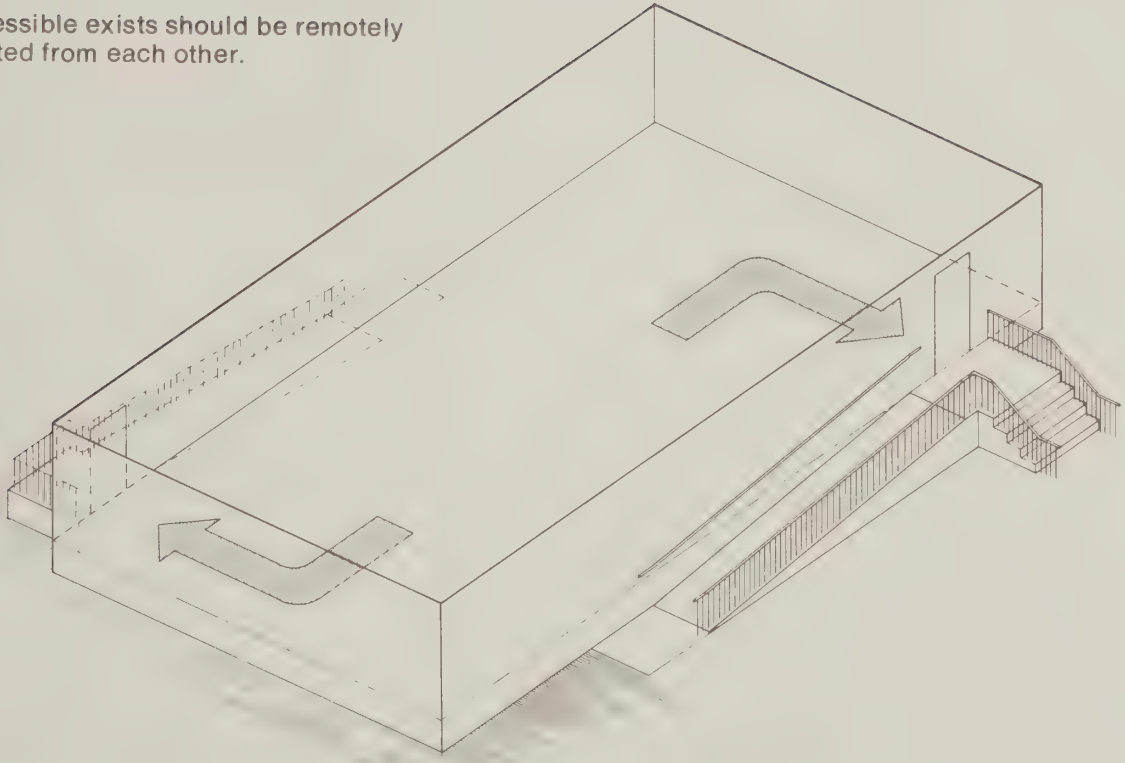
Accessibility at main entrances to buildings is preferred so that the disabled are not stigmatized by "special" or back door entrances. Where particularly difficult conditions exist at entrances, such as high monumental stairs and split level interior vestibules, the extreme measures necessary to provide accessibility may be prohibitive due to costs, appearance, historical value, etc.

However, it is very often possible to find a location elsewhere on the building where grade is closer to floor level and where a new entrance can be opened to provide accessibility.

Buildings modified for accessibility should provide at least two remotely located accessible entrances for exit in case of emergencies.

Emergency exit from upper floors of multistory buildings by severely disabled persons who are dependent upon elevators for vertical transport is a serious concern because elevators usually cannot be used during a fire.

Accessibility should, however, be provided to all floors if possible, and measures taken for fire prevention. Early detection and control of fire and a plan for emergency rescue should be developed.

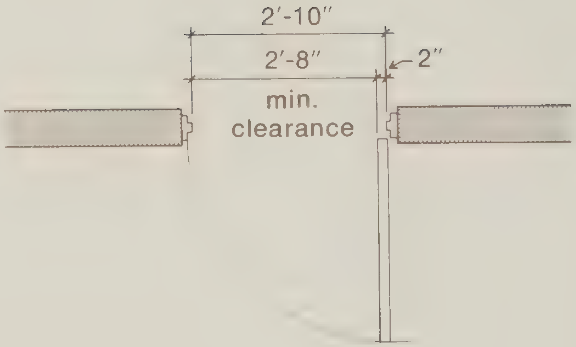


Accessible exists should be remotely located from each other.

doors
widening

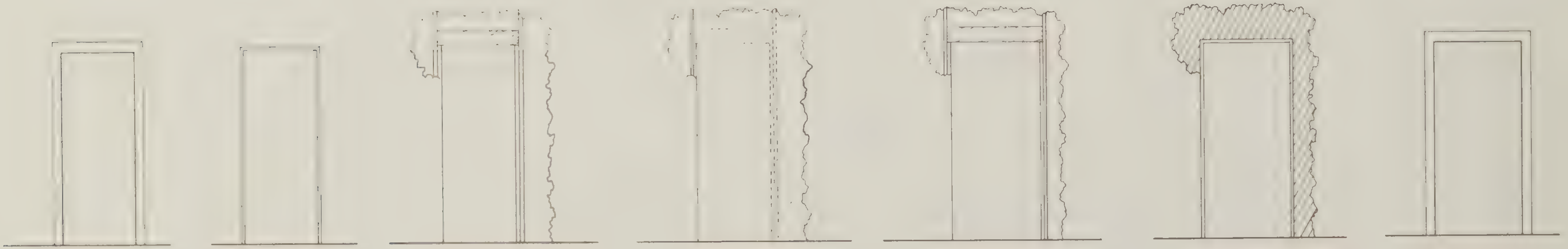
Adult wheelchairs vary in width from a standard 2′-3″ up to 2′-8″. Allowing space for hands and assuming a standard 2′-3″ wide chair, doors for use by persons in wheelchairs or with walkers should provide at least 2′-8″ clear opening with door in the 90° open position.

This will usually require at least a 2′-10″ wide door allowing 2″ ± for door thickness, jambs, and throw of hinges. Cost and simplicity indicate it is desirable to use 3′-0″ doors.



Widening of existing doors to provide accessibility can vary widely in cost and complexity depending upon the type of door, wall material, and location. In all types of construction door widening is a complex process which must be carefully considered. Illustrated below are the possible steps involved in widening doors in different types of walls. Actual procedures may vary from those shown.

It may be possible in some cases to achieve the necessary clear opening by removing the stop or reshaping the jamb without cutting the wall.



Existing narrow door

Remove trim and frame

Cut back plaster or wallboard to expose framing at one side and top

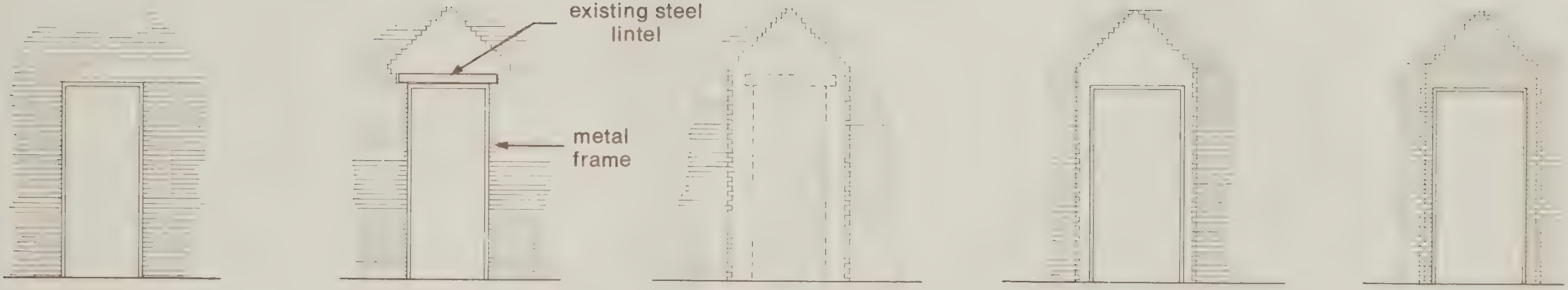
Cut and remove existing jamb framing and lintels

Install new jamb framing on one side and new lintel

Install new frame and patch plaster to match existing

Install new trim, and paint

DOOR WIDENING—WOOD FRAME WALL



Existing narrow door

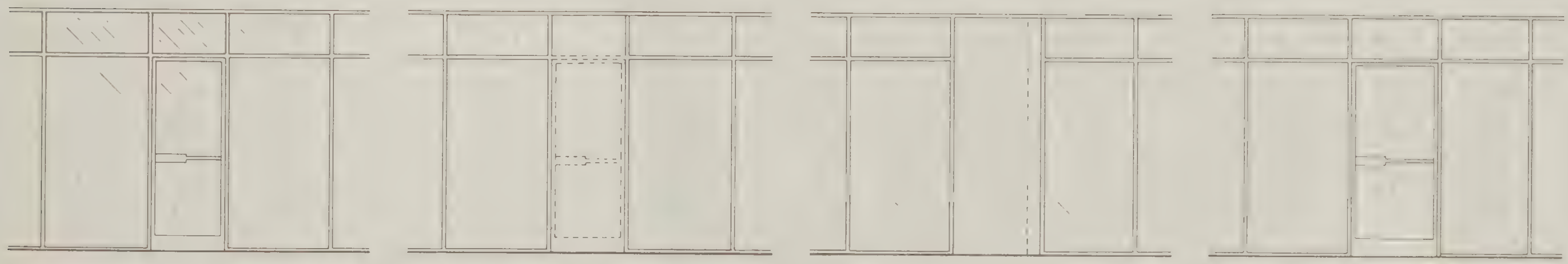
Remove masonry above door to expose existing lintel. Provide support for wall above or brace temporarily

Remove existing metal frame and lintel and surrounding masonry

Install new metal frame with integral or separate lintel to fit 2′-10″ or 3′-0″ door

Patch masonry and refinish to match existing

DOOR WIDENING—METAL FRAME IN MASONRY WALL



Existing narrow door

Remove door, cross bar, & transom glass

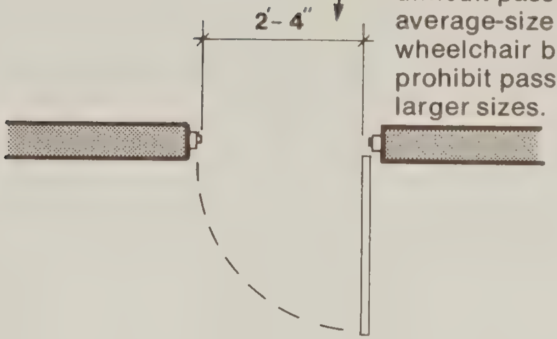
Move one jamb member to provide necessary opening
Cut & refit existing glass

Install new door, transom glass, & cross bar lintel

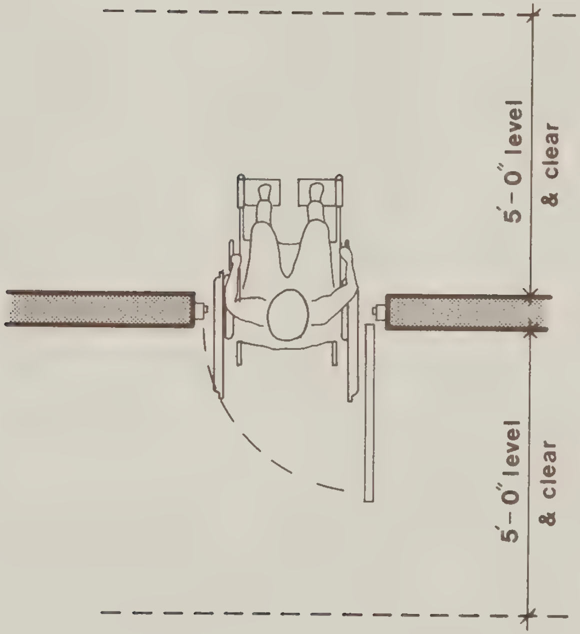
DOOR WIDENING—METAL FRAME—GLASS WALL

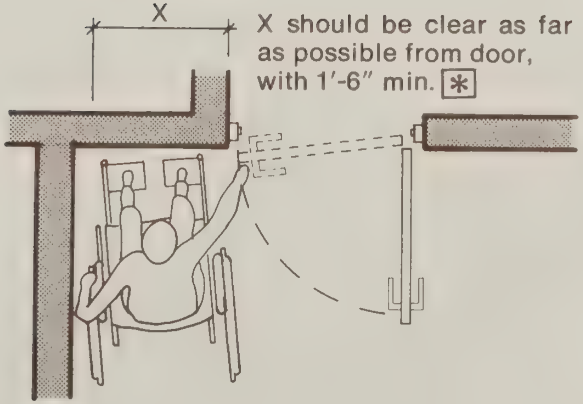
In existing buildings not all doors must be widened to 2′-8″ clear. Although this may be desirable, costs and other considerations may be prohibitive. Entrance doors, doors in route of travel through building, and doors to essential facilities such as toilet rooms should take precedence.

doors
space requirements



2'-4" minimum existing clear opening will permit difficult passage of average-size adult wheelchair but will still prohibit passage of larger sizes.



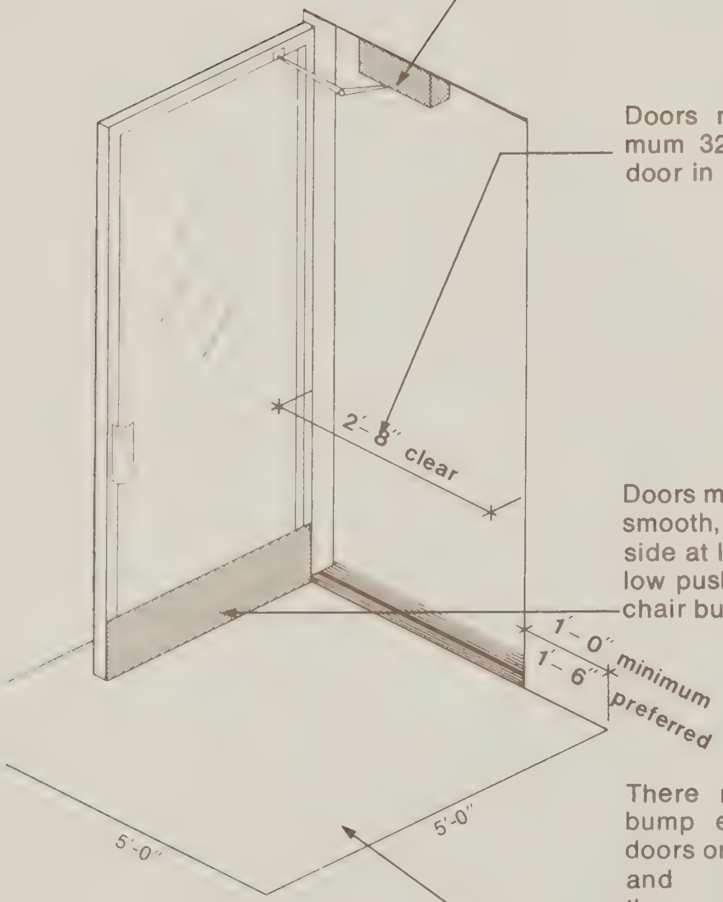


X should be clear as far as possible from door, with 1'-6" min. [✻]

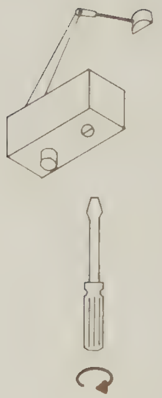
Existing doors which provide a clear opening of at least 2'-4" as shown, can be negotiated with difficulty by people in average adult wheelchairs if adequate clear and level space is available each side of the door to allow chair to enter and leave the door opening at 90° to the wall. This will require about 5'-0" each side of door.

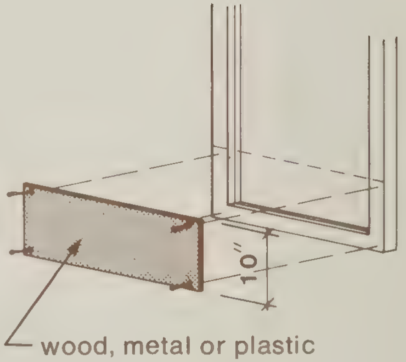
Double door vestibules with less than 6'-6" between the consecutive doors should be modified. See illustration page 37.

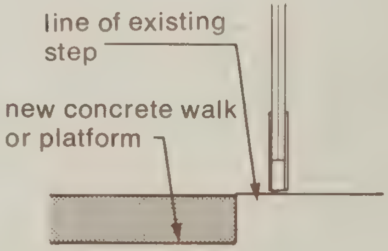
Clear space is required on the pull side of doors on the handle side. Space should be maximum with 18" minimum [✻]. Furnishings, movable equipment, and walls if possible should be moved back to provide this space. Where walls cannot be moved, doors should have very light pressure closers or preferably no closer. Doors without closers should have auxiliary handles as shown on page 24.

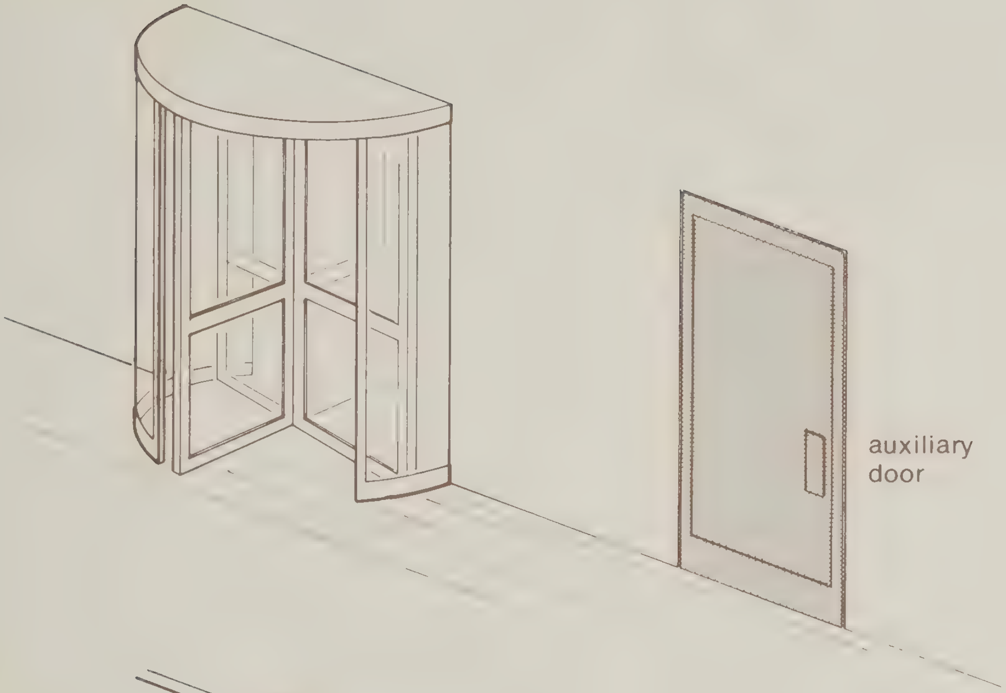


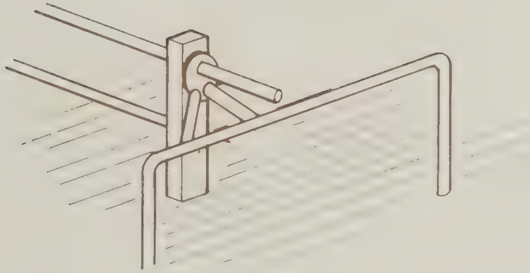
REQUIREMENT FOR HANDICAPPED	MODIFICATION TO EXISTING ELEMENT
Door closers should not require more than 8 [*] to 15 pound force at the handle to open door.	1. Some closers can be adjusted to provide necessary limits. 2. Install new closer.
Doors must provide a minimum 32" clear opening with door in its 90° open position.	1. Many exterior doors in existing buildings are 3'-0" wide and therefore need not be changed. 2. Install new door. See pages 18-19. 3. If narrow doors cannot be replaced for economic, esthetic, or other reasons, a separate new door can be installed elsewhere in the building to provide access.
Doors must have a continuous, smooth, kick plate on the push side at least 10" [*] high to allow pushing open with wheelchair bumpers.	1. Often such push plates can be simply and inexpensively added to existing doors. 2. New doors can be ordered with built-in kick plates.
There must be no step or bump exceeding ½" [*] at doors or thresholds, and there must be a level area 5'-0" X 5'-0" at doors. 1'-0" to 1'-6" [*] space to side of door on pull side must be clear. See space requirements page 21.	1. Install smooth or sloping threshold. 2. Raise level of sidewalk or build new platform at floor level.

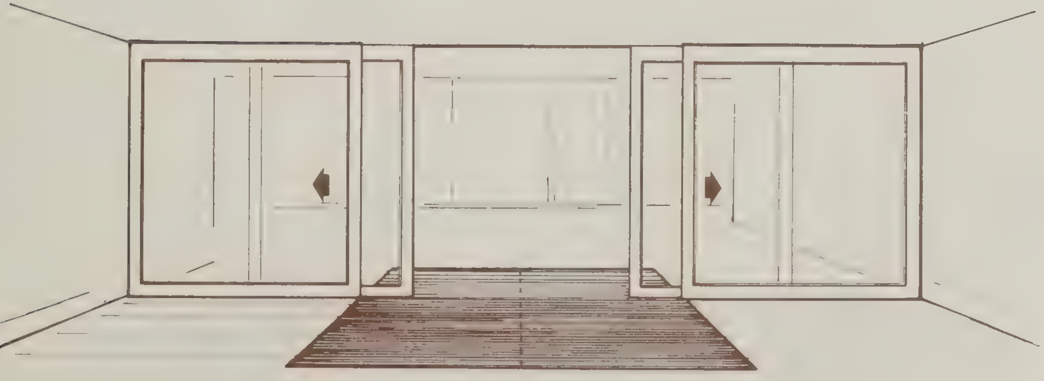












REQUIREMENT FOR HANDICAPPED	MODIFICATION TO EXISTING ELEMENT
Revolving doors cannot be used by most handicapped people.	Install swing door adjacent to revolving door. See pp. 18-19.
Turnstiles cannot be used by handicapped people.	1. Remove turnstiles. 2. Provide alternate route around turnstiles. 3. If traffic control is necessary, there are swinging gate devices which serve the purpose and do not restrict handicapped people.
Sliding electrical power doors are ideal for all handicapped people. Swing power-operated doors are also good for most people, but may be a hazard to the blind or visually impaired.	If used, swinging power-operated doors should always have protective guide rails for approach, and they should not operate if people approach them from the out-swinging side.

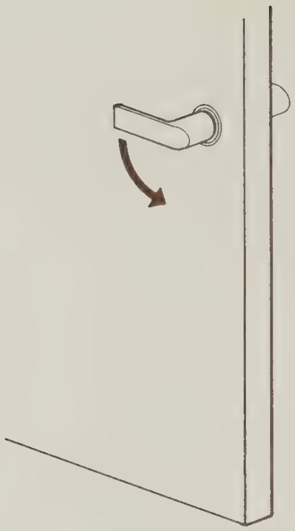
doors
hardware ⧆

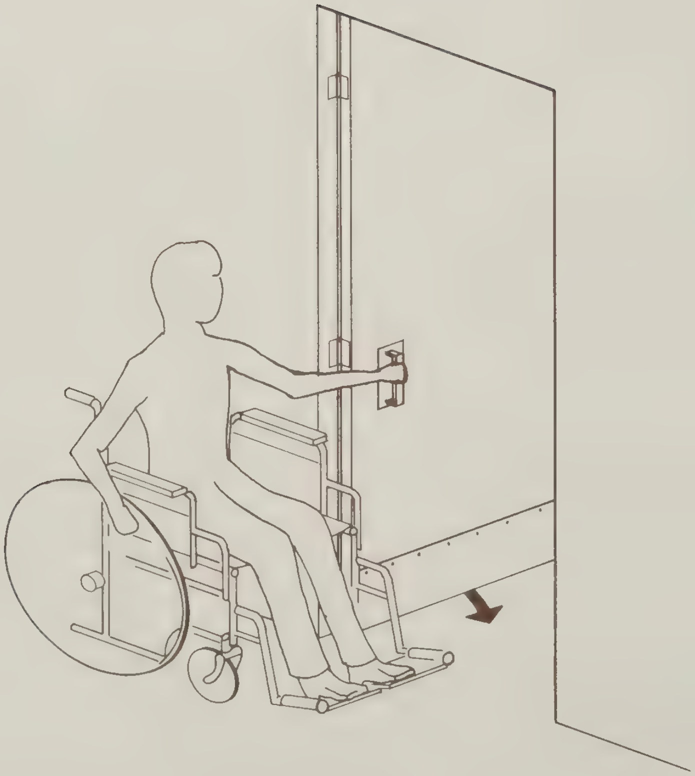
Knob-type handles on doors require gripping, twisting, and pulling to open the door. Many disabled people do not have such gripping ability.

Lever-type handles can be operated by a single, non-precise movement not requiring gripping or twisting, and can be operated by people with little or no use of the hands or no hands, and by people whose hands are full.

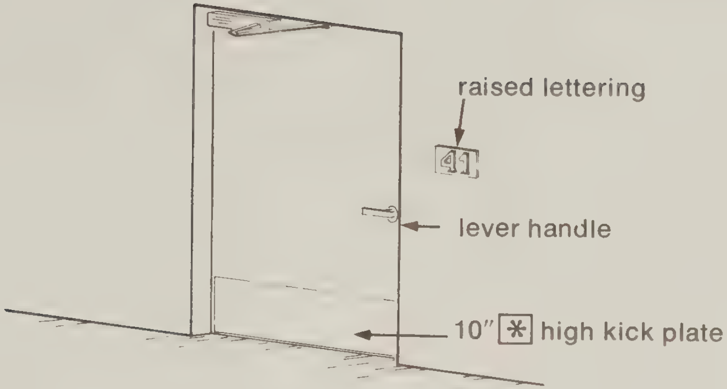
Some disabled people cannot hold the door handle, move through the opening, and pull the door closed all at the same time. Once through the opening, they often cannot reach the handle or knob to pull the door closed.

Auxiliary handles located as shown can provide a solution to this problem.





doors
hardware & thresholds

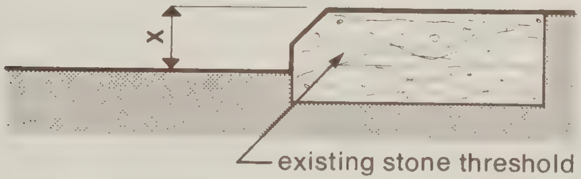


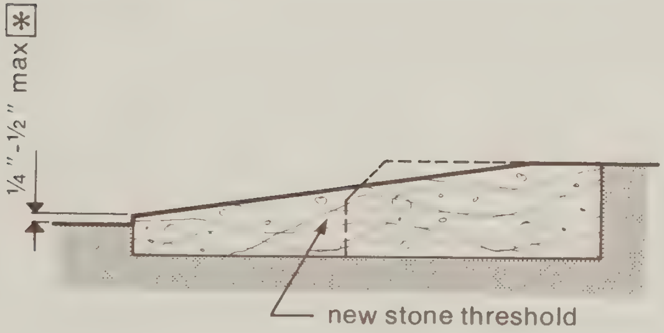
Doors which have automatic closers should have 10" [*] high smooth kick plate at bottom on push side.

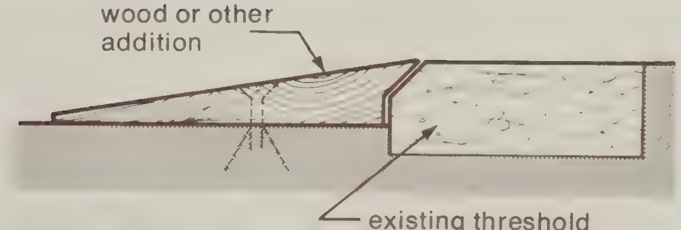
Rooms should be marked by large, raised lettering in sharply contrasting colors located on the wall to the side of the door on the handle side.

Thresholds with abrupt changes in level of more than ½" [*] can block wheelchairs and walking aids and trip walking people. Such thresholds are usually found at toilet rooms which have tile floors. Thresholds with such rises should be replaced with low or sloped thresholds which blend with floor levels or have maximum ¼"-½" vertical rise.

If X exceeds ½" threshold should be modified. [*]

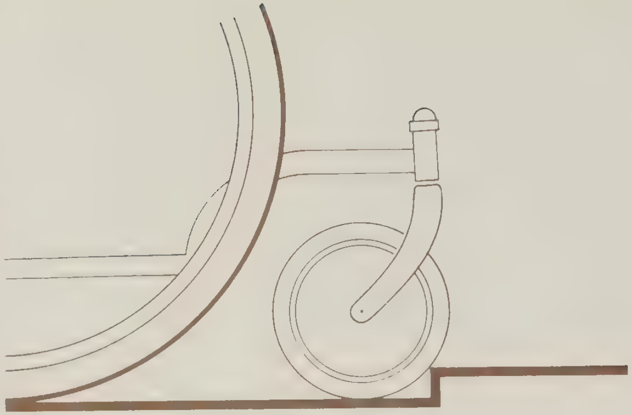




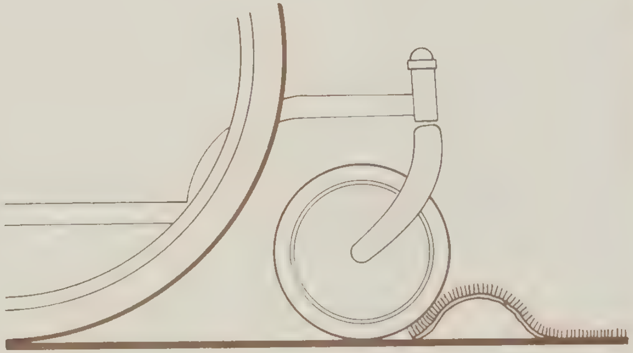


floors & halls

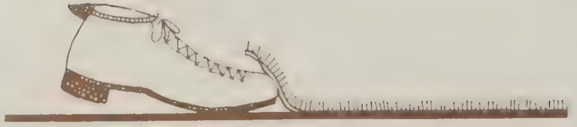
Smooth, hard, slip-resistant floor materials at a common level are best. Abrupt changes in level of more than ½″ $\boxed{*}$ should be eliminated or ramped. Thresholds and sills are particular areas where this may occur.

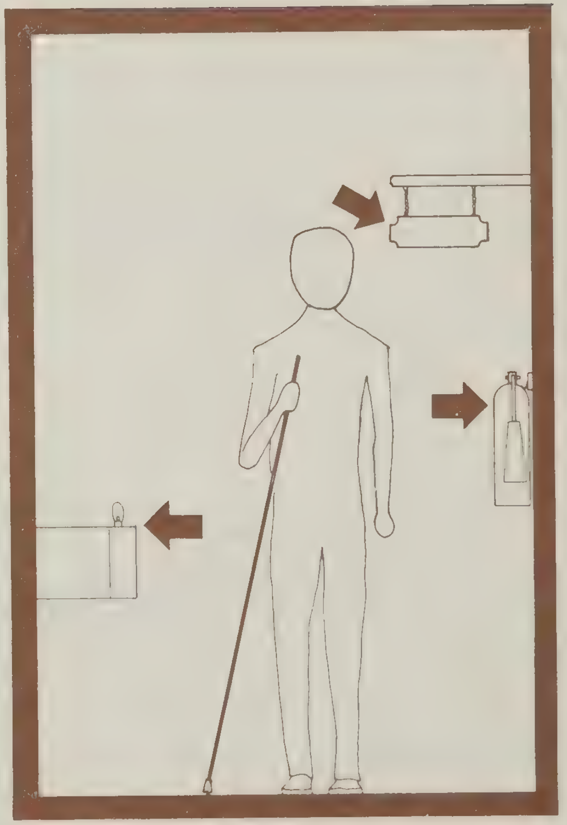


Thick carpets and mats can impede wheelchair traffic and trip walking people.

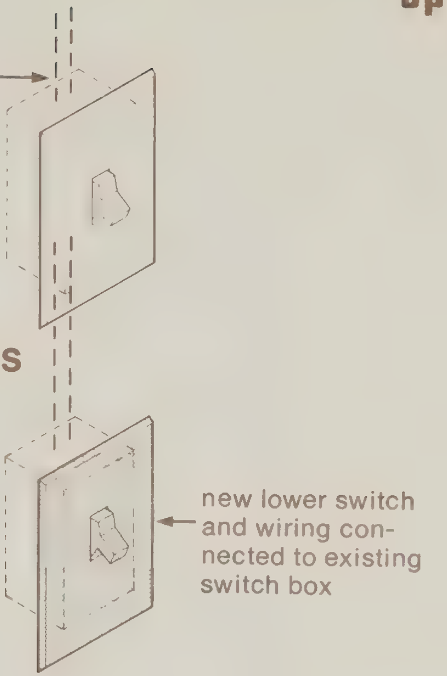


Door mats should be eliminated if possible, or put to one side of door, or be made of short, tightly woven material and not have thick pads underneath. Carpet and mats should be securely fastened down.

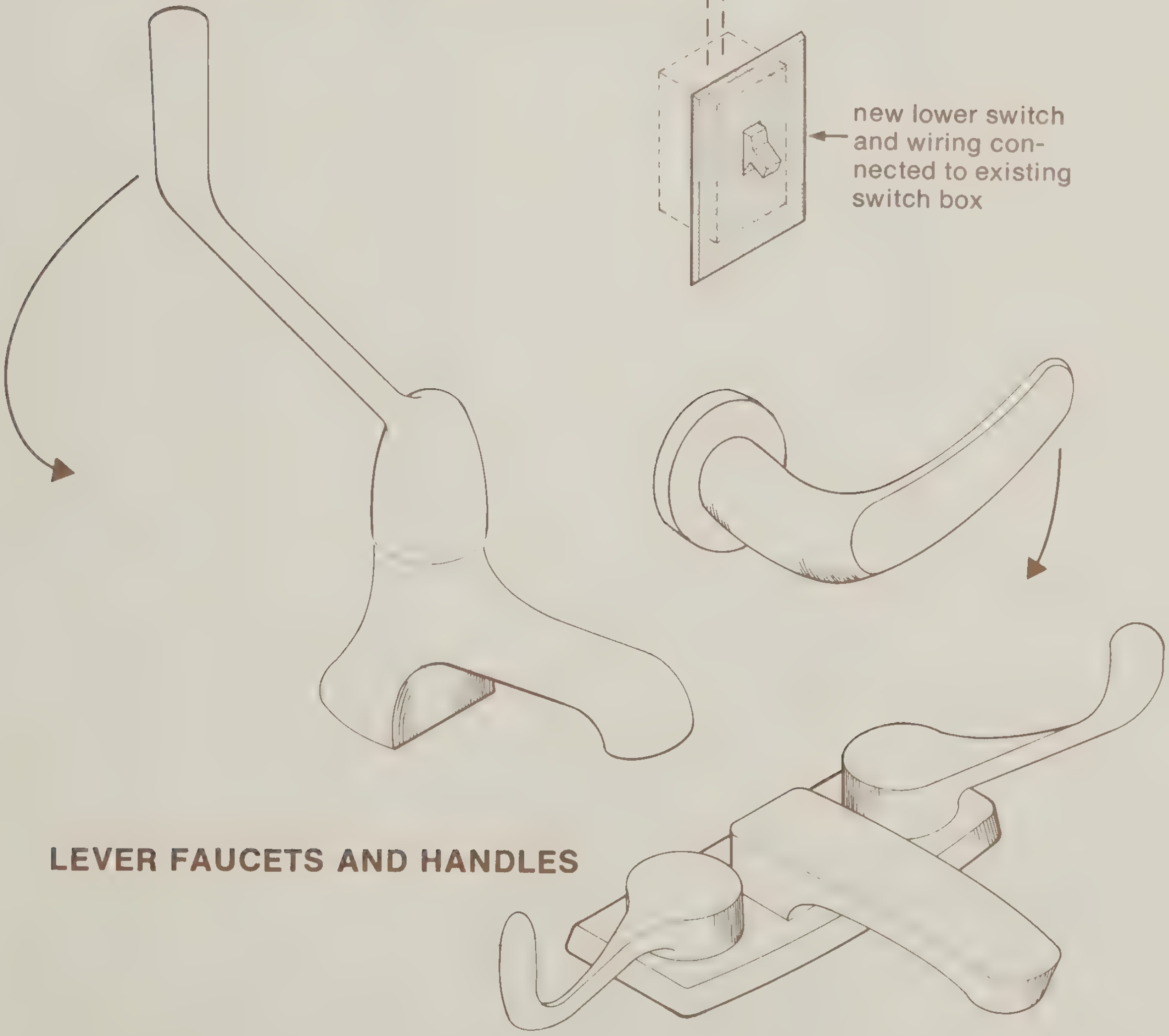




Low overhanging signs, fire extinguishers, fountains, and other objects which protrude into circulation space can be a hazard to blind or visually impaired people and should be removed or marked.


existing wiring and switch
Switch may remain for dual control or be removed, but box must remain for junction and can be covered and patched to match existing wall.
new lower switch and wiring connected to existing switch box

LOWERING LIGHT SWITCHES



LEVER FAUCETS AND HANDLES

Two problems handicapped people have with controls and operating mechanisms are:

1. Reach—controls which are too high or too low or too far away.

2. Grip and Movement—controls which require grasping and precise movement.

Controls will usually be usable by all if they are mounted between shoulder height and head height of an average seated adult (3′-4″ to 4′-0″ above floor). Clear floor space at controls allows close approach and maneuvering room. The higher a control is placed, the more important close approach becomes.

Controls which require gripping and/or precise movement—such as door knobs, faucet knobs, and rocker switches—or controls which require more than one simultaneous movement are difficult or impossible for some. Lever-type door handles, faucets, and switches etc. are preferred because they can be operated by single, non-precise movements and do not require gripping. Such controls can be operated by bumping with hands, elbows or other body parts and can even be operated by people who have no hands. Lever controls can usually be simply added to existing fixtures.

Light switches can be lowered or new switches can be added to existing switches at lower level.

changes in level
elevators

Elevator shafts can be placed inside existing buildings if:

1. A common accessible space can be located on each floor.

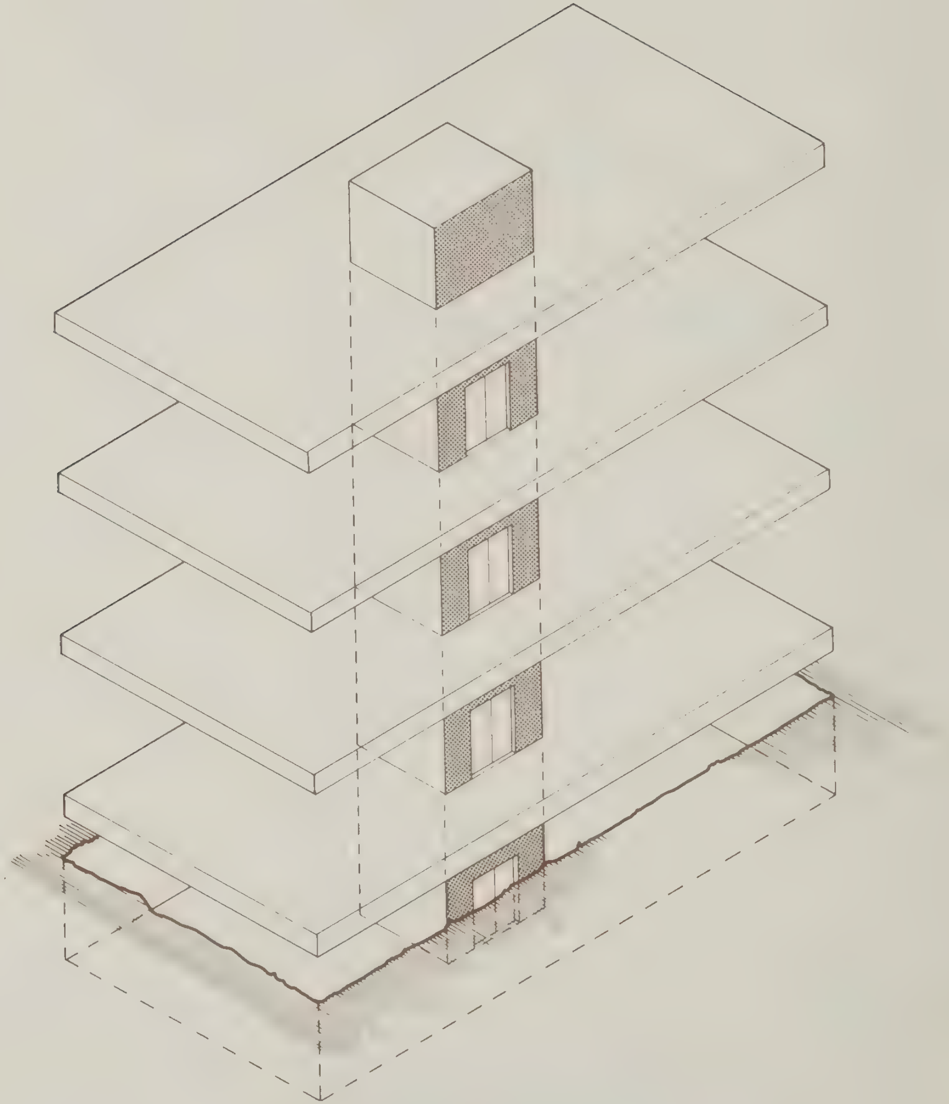
2. Location does not interfere with heating and ventilating equipment.

3. Location does not interfere with major structural framing for the building.

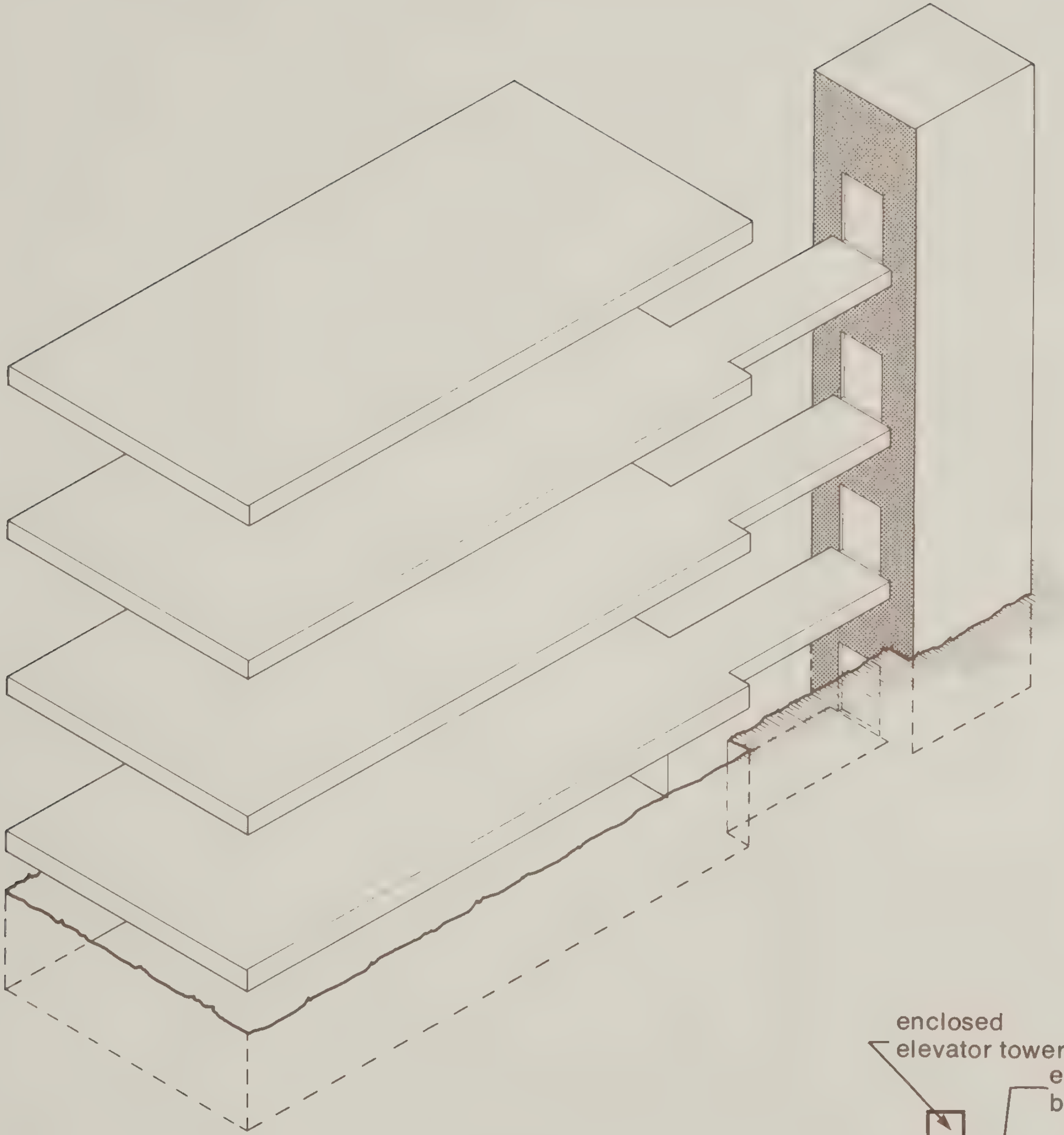
4. Function of the building can be terminated during construction.

5. Floors and roof can be remodeled to accommodate shaft.

Cable-operated elevators which require a large penthouse on roof or in attic space can affect the appearance of the building, and may be especially difficult on buildings with sloping roofs.



changes in level
elevators

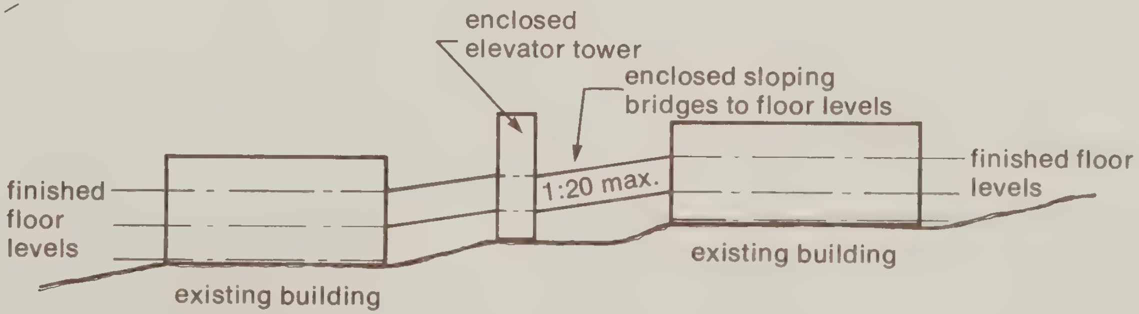


Elevator shafts can stand free of existing buildings and be connected by bridges to floor levels.

Bridges can slope if necessary to meet floor levels.

This location will not interfere with mechanical or structural systems in the building and will not disrupt operation of the building during construction and should cost less.

One elevator could serve more than one building or wings of a building with different floor levels.



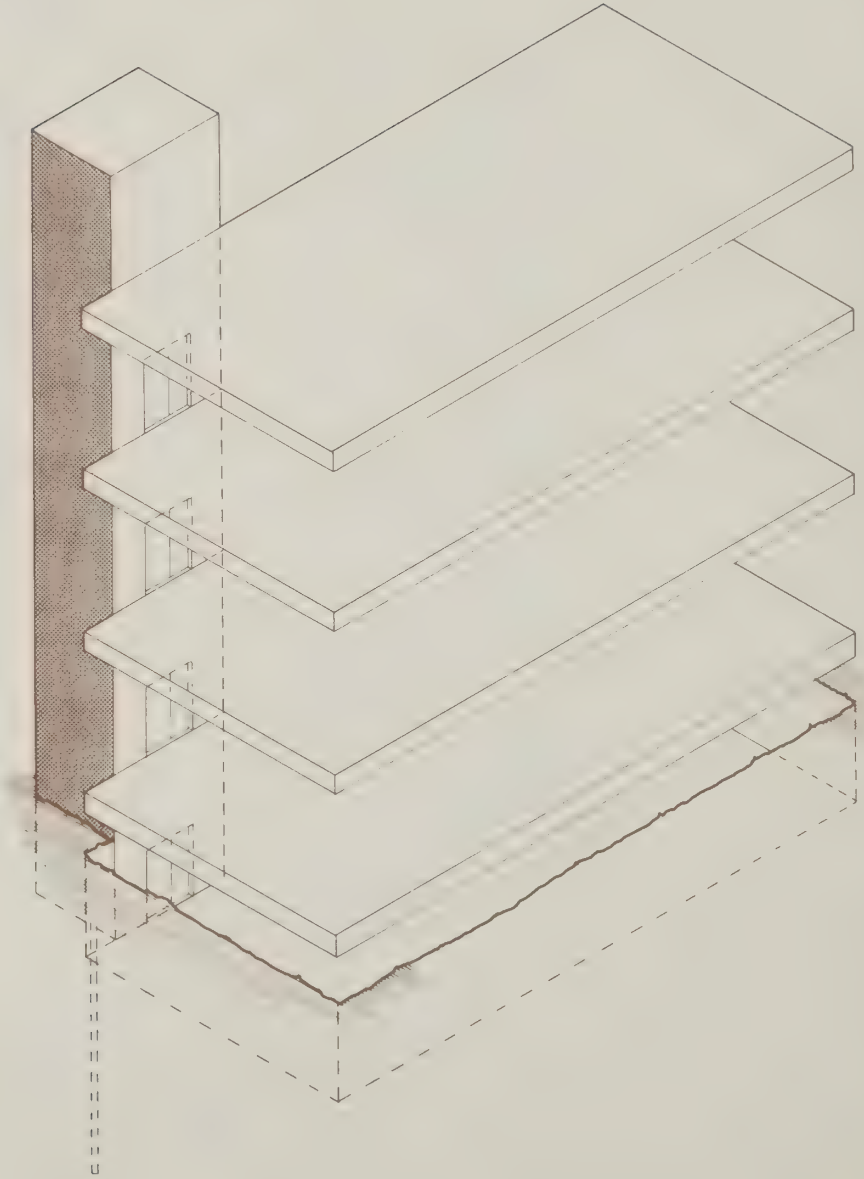
changes in level
elevators

Elevator shafts can be placed against an exterior wall of an existing building if:

1. A common accessible space can be located on each floor at the same spot on the exterior wall to serve as lobby space and

2. If the shaft can be made to blend with the style of the building, or if it can be located in an inconspicuous place, or if exterior appearance is not a critical factor.

Note: This location will not significantly interfere with mechanical or structural systems in the buildings and will not disrupt operation of building during construction and should cost less.

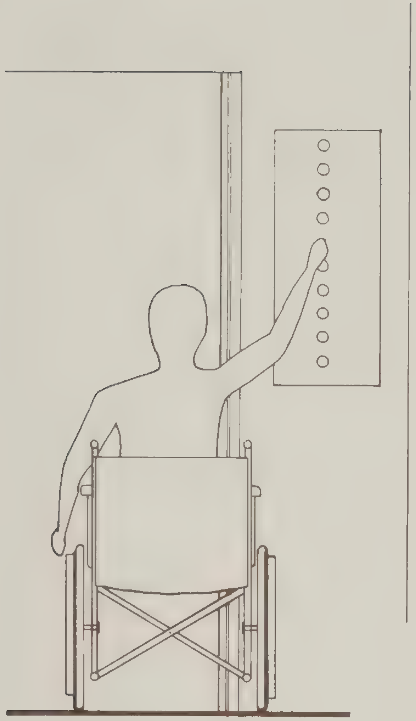


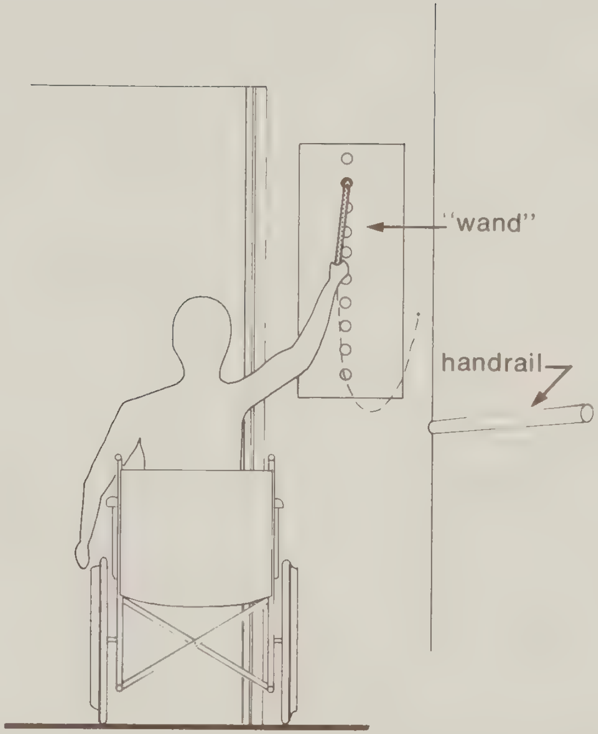
Hydraulic elevators:

1. Require shaft below bottom floor for piston as deep as height to top floor.

2. Require drilling rig inside building during construction.

3. Require equipment room for pumps, etc., on bottom floor.





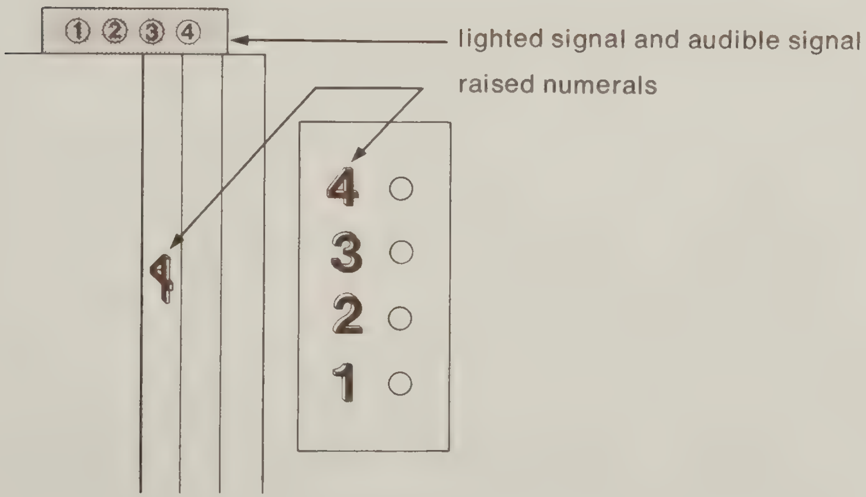
Elevator buttons both inside elevators and outside in lobbies which are too high for a seated person to reach are a problem.

Existing elevator control panels might be lowered or an additional set installed at a lower level.

One solution which has been tried is to install a wand or stick device attached to wall by chain or clips, which might be used by short or seated people to reach buttons.

This effort is usually unsuccessful due to vandalism or theft, but could help if theft can be prevented.

Additional elevator problems: some people lack good balance and coordination and need handrails in moving elevators for stability. These could be added to existing elevators.



Elevators should have raised numerals *beside* elevator buttons to aid the visually impaired in floor selection, and raised numerals on the door jamb at each floor to aid in identifying floor level. ⧆

These numerals should be as large as possible and be raised at least 1/16"-1/8". They can be applied mechanically or with adhesive. Vandalism may be a problem with applied numerals unless they are made of durable material and are securely fastened. ⧆

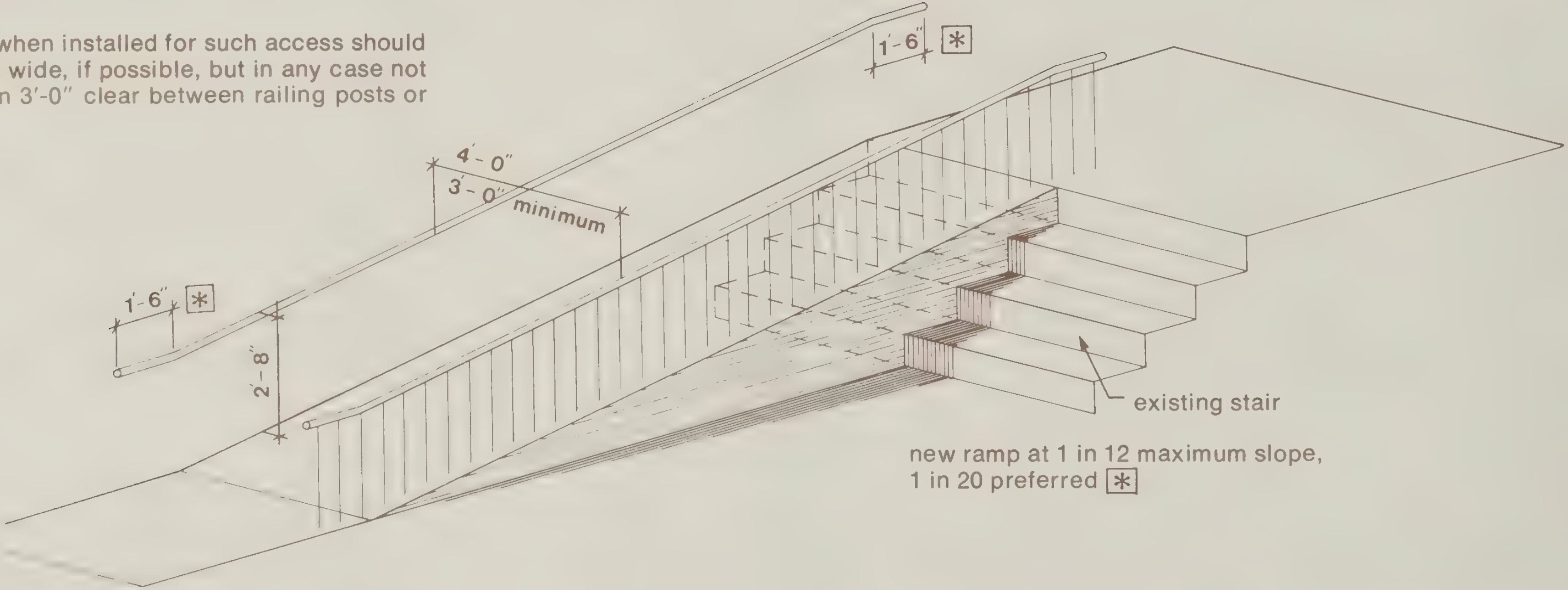
Talking elevators which electronically announce floor when car arrives are preferred. ⧆

changes in level
ramps

Ramps can be used to provide access to interior split floor levels, provided the rise is not too great and the ramp is properly designed. Improperly designed ramps—too steep, too long, too slick, too narrow, and without proper handrails—are a safety hazard to everyone.

Ramps when installed for such access should be 4′-0″ wide, if possible, but in any case not less than 3′-0″ clear between railing posts or walls.

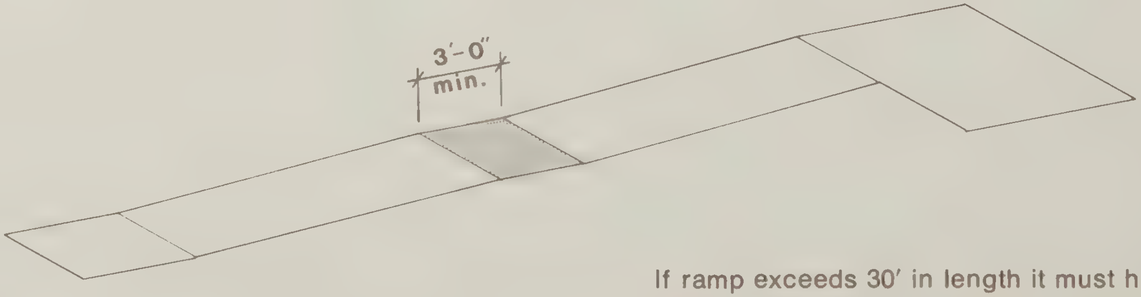
Some disabled people find ramps more difficult to negotiate than steps. For this reason it is best not to entirely replace existing steps with ramps. Steps should have smooth risers and handrails with extensions as illustrated on page 35.



new ramp at 1 in 12 maximum slope,
1 in 20 preferred ⊛

Ramps must have a clear, flat floor area at top and bottom.

Ramps must have slip-resistant surfaces—carborundum grit, strips, or rough concrete are acceptable surfaces. Handrails are essential and must be 2′-8″ above ramp surface and must extend 1′-6″ ⊛ beyond top and bottom as indicated in illustration.

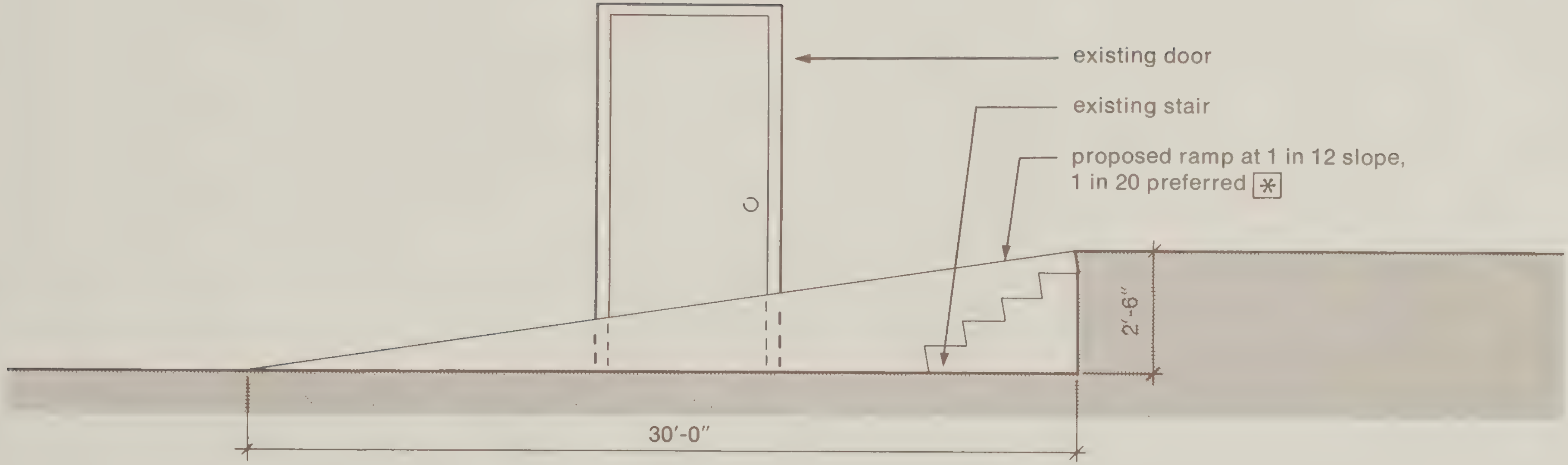


If ramp exceeds 30′ in length it must have an intermediate flat rest landing at least 3′-0″ long.

changes in level
ramps

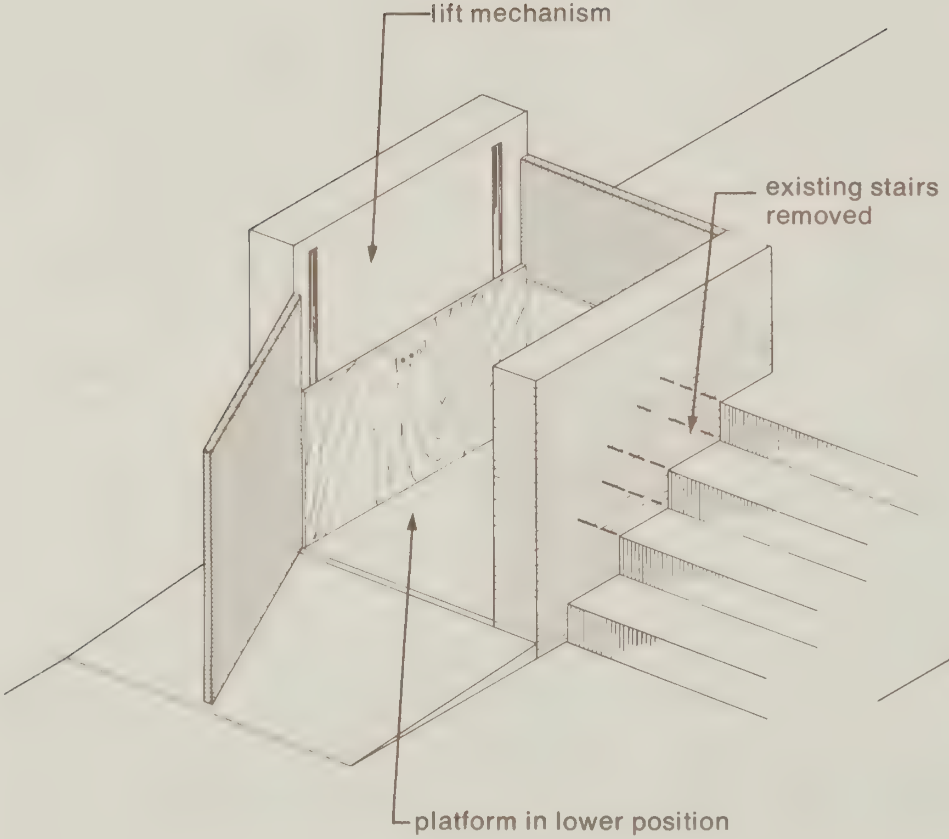
Ramps as a means of access to different floor levels in existing buildings are often impractical because of space required to install ramps at the necessary 1 in 12 slope or the preferred [*] 1 in 20 slope.

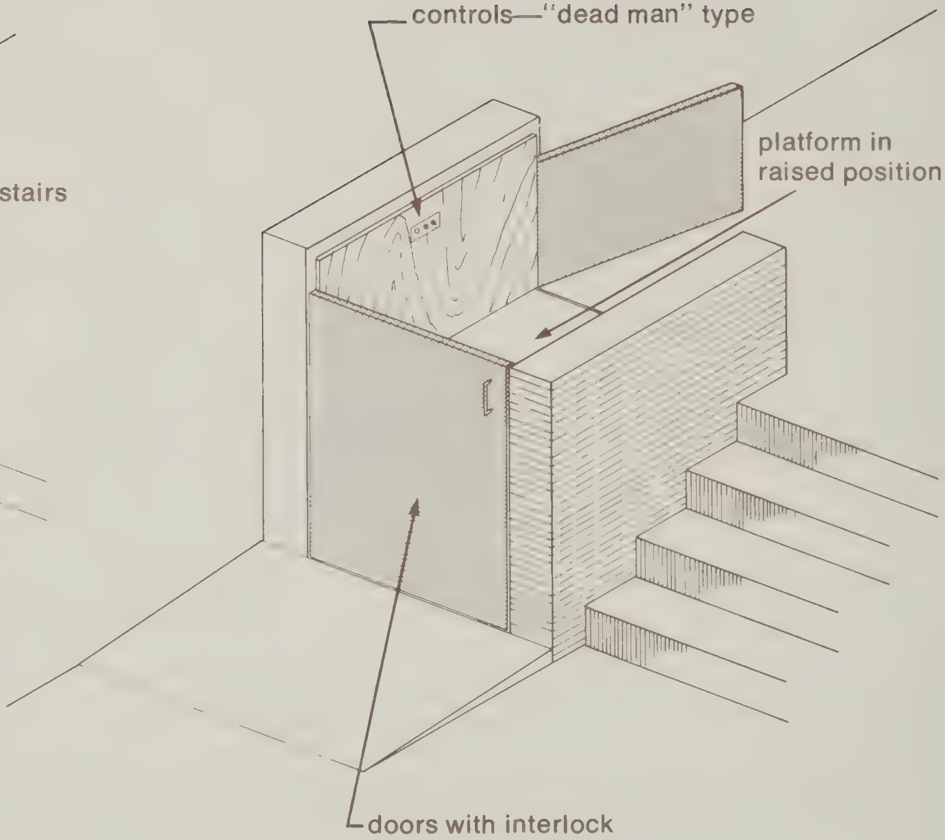
Changes in levels often occur in corridors, and doors to rooms along the corridor may prohibit installation of ramps for accessibility.



For additional information on ramps, see pp. 8-13.

changes in level
lifts





In certain installations where ramps may be impossible due to space limitations, small mechanical wheelchair lifts can be installed to overcome level changes. There are several lifts available and their cost should not exceed cost of ramps and railings in many installations.

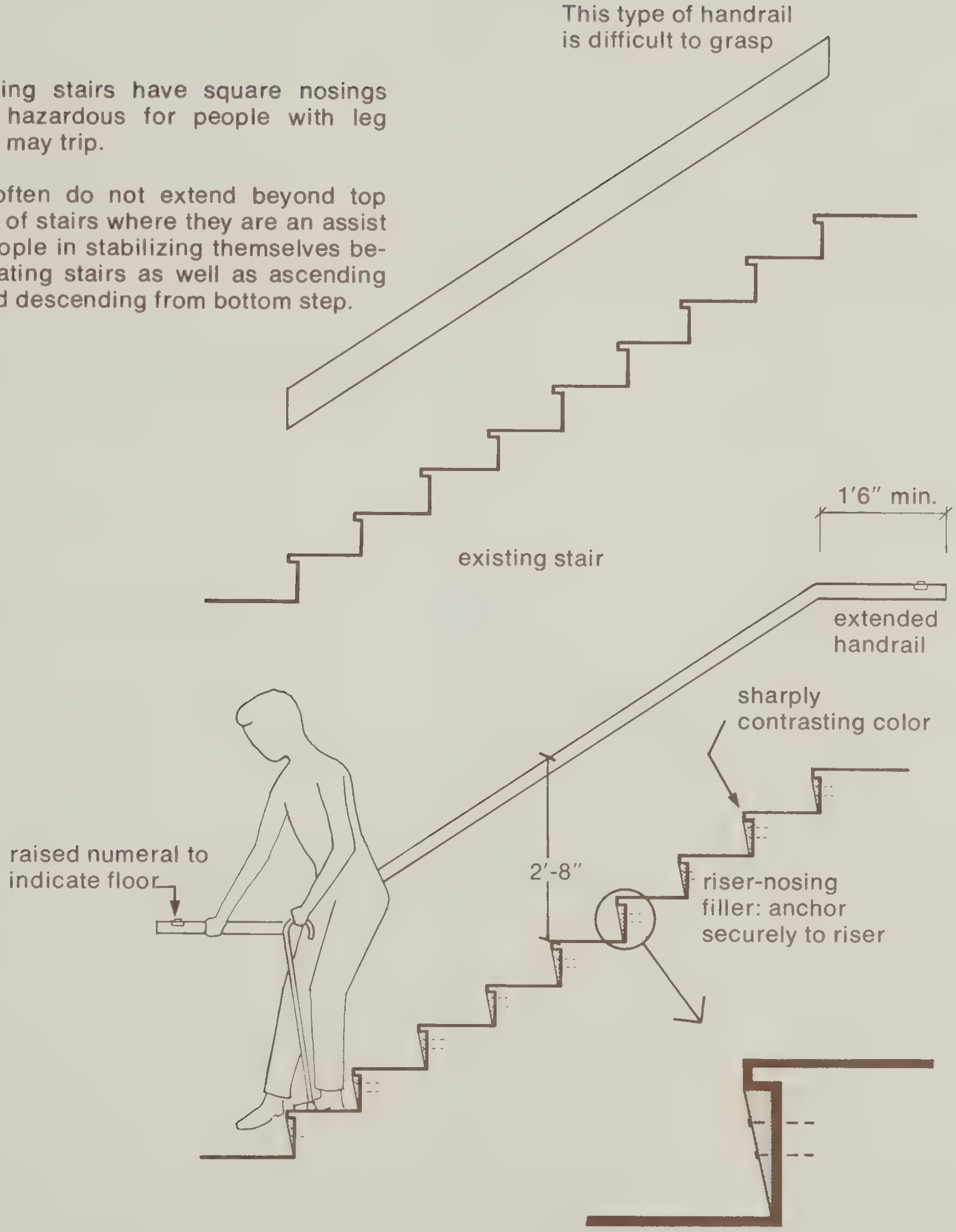
Lift illustrated is suggested as a possible method of installation in private-use facilities. Open lifts as discussed here are presently prohibited by State elevator codes.

Although such lifts seem an excellent spacial and economic solution to level changes in existing buildings, their use is currently restricted by the N.C. Department of Labor Elevator Codes to private use facilities or residences because of potential hazard. Manufactured lifts have a lift range from two to several feet and are either electro-mechanical, hydraulic, or pneumatically operated. A recent pneumatic lift has a much-desired reserve air tank, which provides several operations after power failure.

Lifts can be semi-enclosed and equipped with entrance interlocks for safety, and either key operated for limited use or button type, "dead man" controls are recommended for safety.

Many existing stairs have square nosings which are hazardous for people with leg braces who may trip.

Handrails often do not extend beyond top and bottom of stairs where they are an assist to many people in stabilizing themselves before negotiating stairs as well as ascending top step and descending from bottom step.


This type of handrail is difficult to grasp
existing stair
1'6" min.
extended handrail
sharply contrasting color
raised numeral to indicate floor
2'-8"
riser-nosing filler: anchor securely to riser

Modifications to existing stairs can be a costly item, particularly in multi-story buildings. Such modifications are obviously more important in buildings where stairs are the only means of vertical circulation and less important where elevators offer the primary means of vertical circulation.

If there are no handrails at stairs, they should be added and should provide 1'-6" minimum horizontal extension beyond top and bottom step. Where stairs will be used by children, a second lower handrail should be installed.

Handrails should be provided on both sides of stairs, and should continue around landing. ⧆

If handrails exist but do not have horizontal extension, they should be modified or replaced.

If horizontal extension cannot be installed on either left or right handrails, they should be installed on the other.

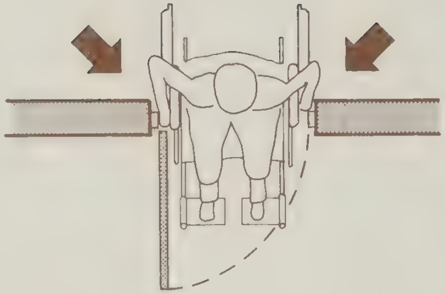
Raised numerals ⧆ which indicate floor level and are fastened on the top of handrail extensions near the end are an aid to the blind who may not be able to tell what floor they are on.

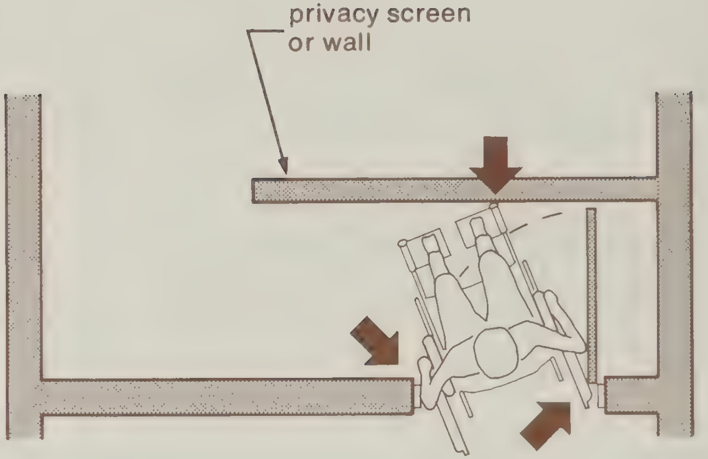
Square nosings can be modified as shown by addition of fillers securely anchored to riser face.

Front edge of former nosing and 1" wide strip on tread at nosing should be of a sharply contrasting color ⧆ to make stairs more visible to those with visual impairments.

PRIVACY SCREENS AND VESTIBULES

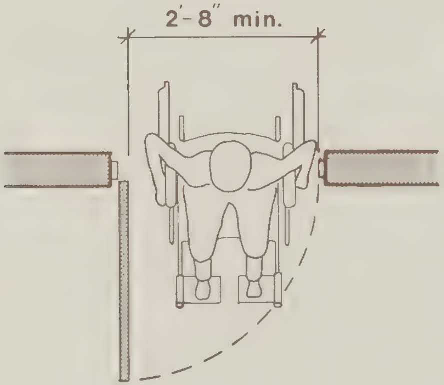
Often existing privacy screens in toilet rooms are so close to door as to make it impossible for a wheelchair to make the necessary turn. Such screens must be removed or relocated to allow at least 3′-6″ clear.

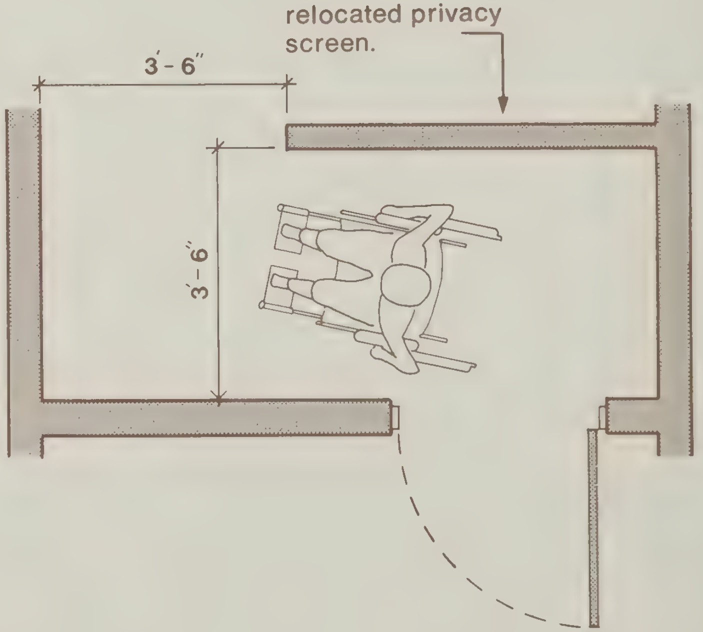


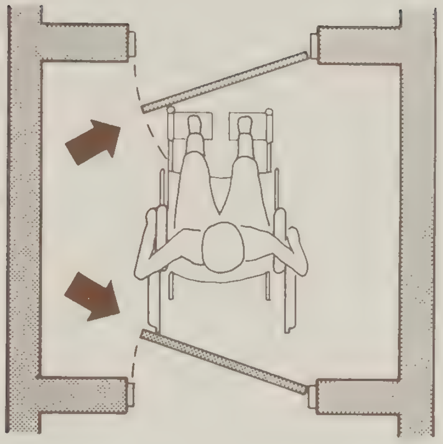


DOORS

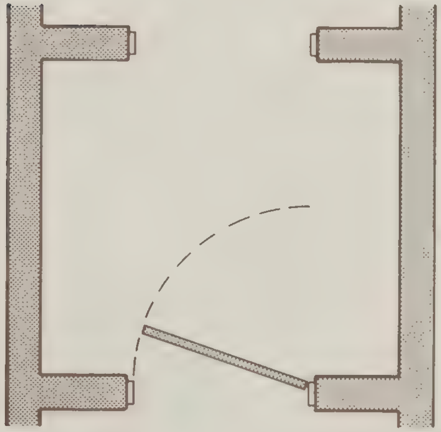
Very often existing toilet room doors are narrower than other doors. Doors must provide 32″ clear opening with door in its 90° open position. See page 21.





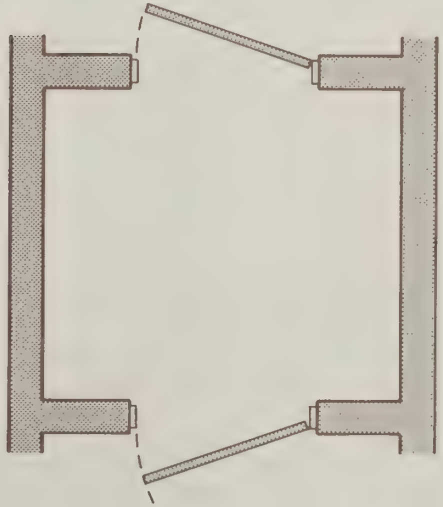


Double door vestibules on toilet rooms are often inescapable traps for persons in wheelchairs.



Remove one door.

This problem is *best* corrected by removing one door.



Swing both doors out.

Where two doors are deemed necessary they should both be made to swing out of the vestibule.

toilet rooms
clear floor space

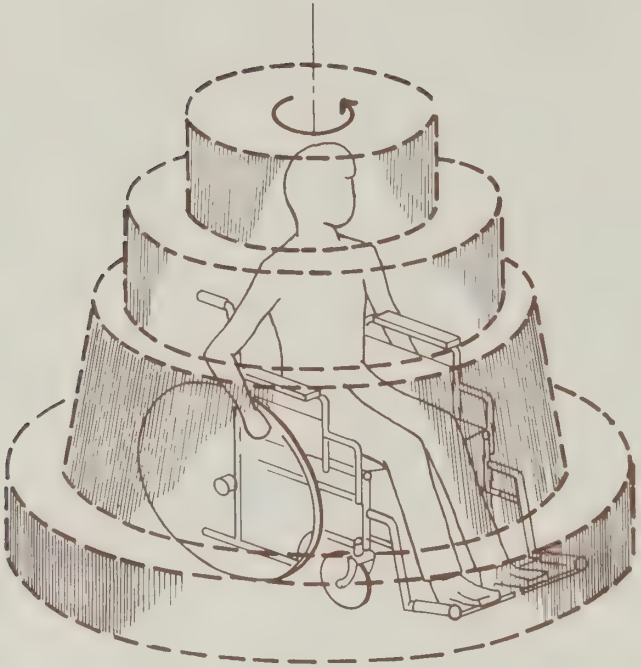
Turning space for wheelchairs is an important consideration in toilet rooms. The N.C. Building Code requires a 5′-0″ X 5′-0″ clear floor space for this purpose.

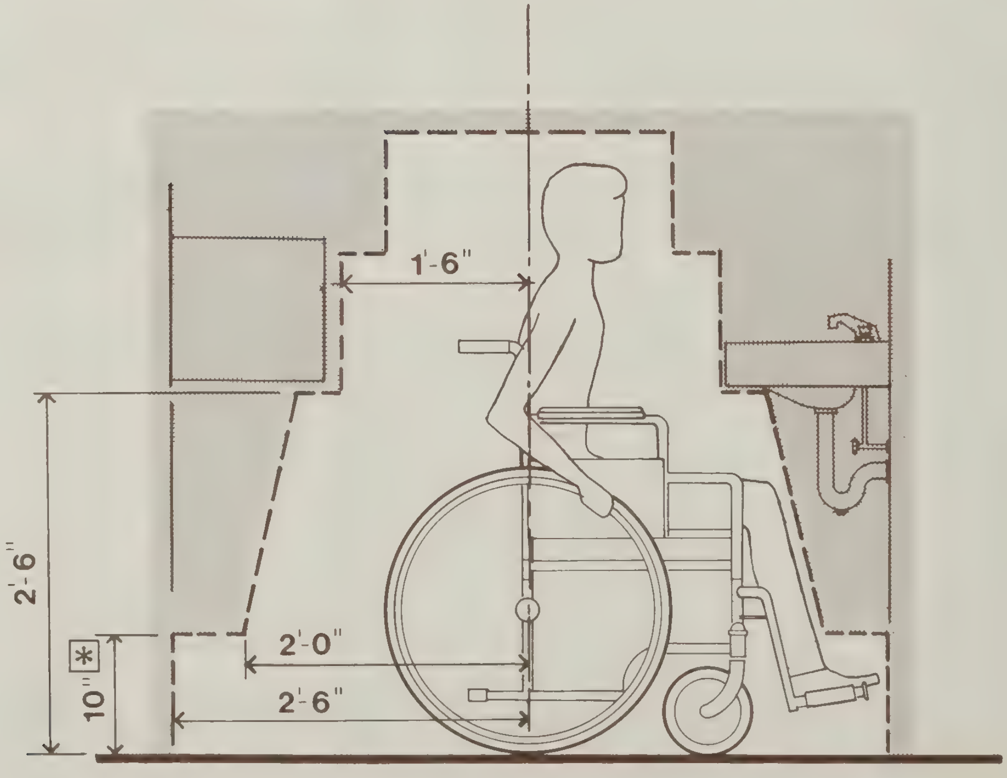
The illustration on this page demonstrates the need for this 5′-0″ X 5′-0″ space to 10″ * above floor, at which height clear turning space may reduce to approximately 4′-0″.

Above 2′6″, the clear space could be further reduced to approximately 3′-0″.

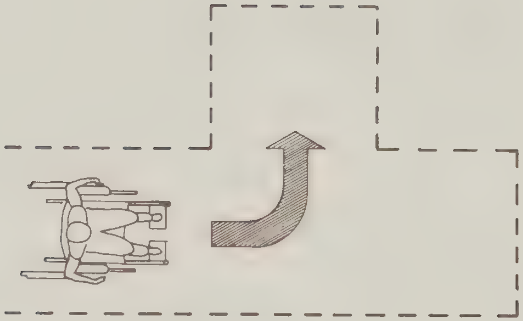
5′-0″ X 5′-0″ clear from floor to ceiling is desirable. Where space is limited, fixtures may overhang the 5′-0″ X 5′-0″ floor space as shown.

Protruding wall-hung objects should be located where they will not be a hazard to the blind.

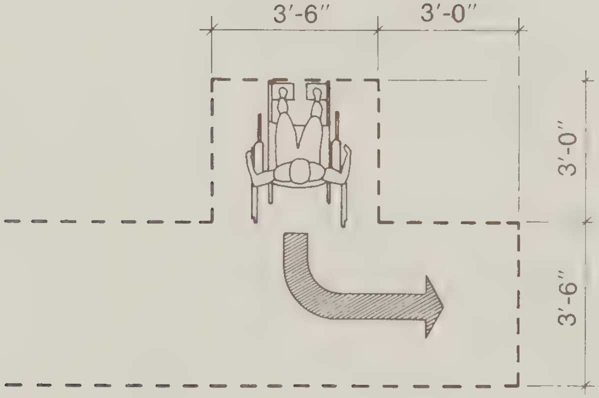




toilet rooms
clear floor space

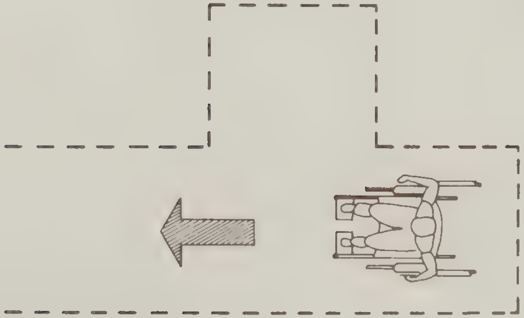


Clear floor space is necessary in toilet rooms to allow wheelchair persons to maneuver to approach the various fixtures, and to allow a 180° turn to exit a room without having to back out.



Where 5′-0″ X 5′-0″ space cannot reasonably be accomplished in existing toilet rooms, space as shown will allow a maneuvering 180° turn.

Such space must not be obstructed by fixtures, waste receptacles, or other items.

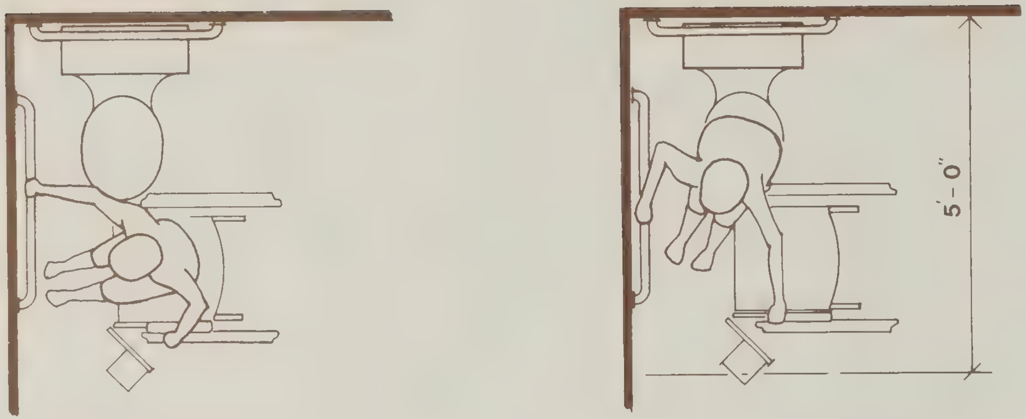


toilet rooms
transfer

The two methods of wheelchair to water closet transfer shown are used by most handicapped people and are the methods usually used in homes.

Minimum space required for these transfer methods is 5′-0″ X 5′-0″.

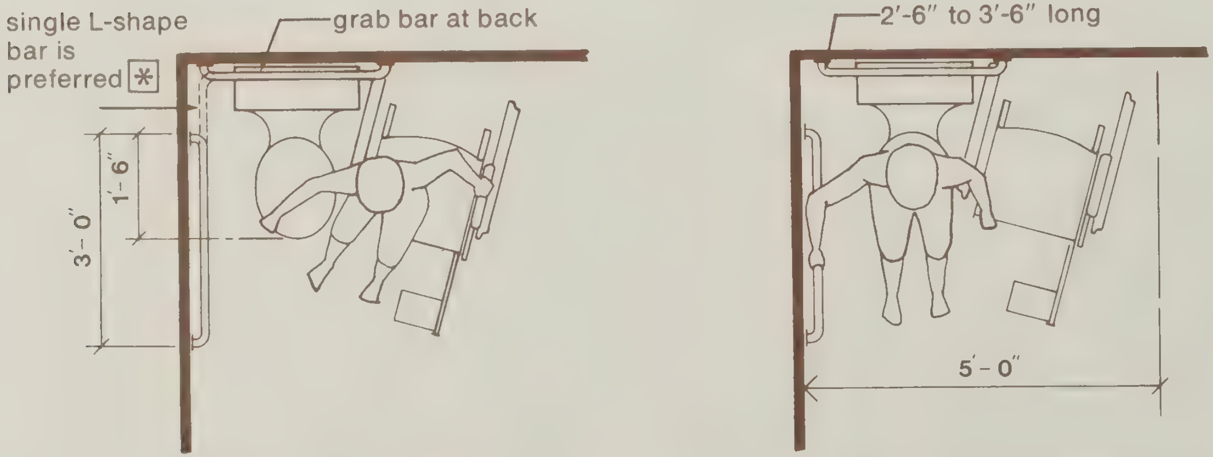
Proper grab bars are essential and should be 1½″ diameter with 1½″ clearance from wall. Grab bars should be mounted 13″ above toilet seat.



Approaches water closet from side. Removes arm rest. Places one hand on grab bar, other hand on chair.

With a lifting and sliding motion, shifts torso onto water closet seat

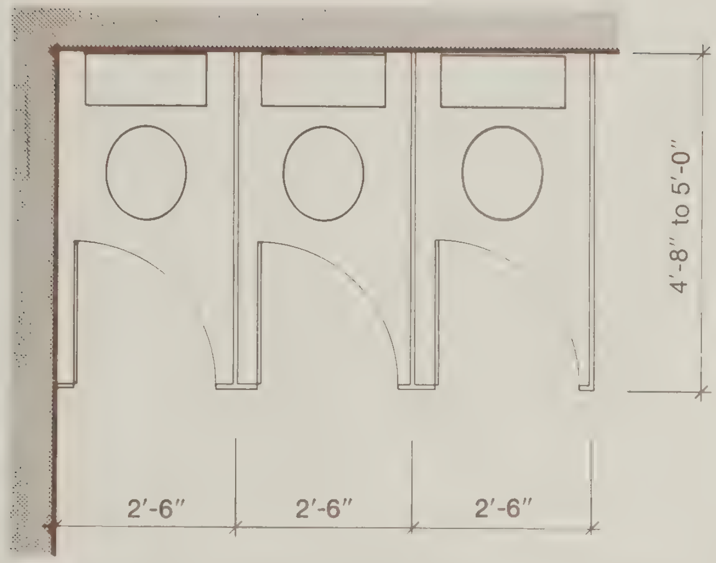
90° TRANSFER METHOD

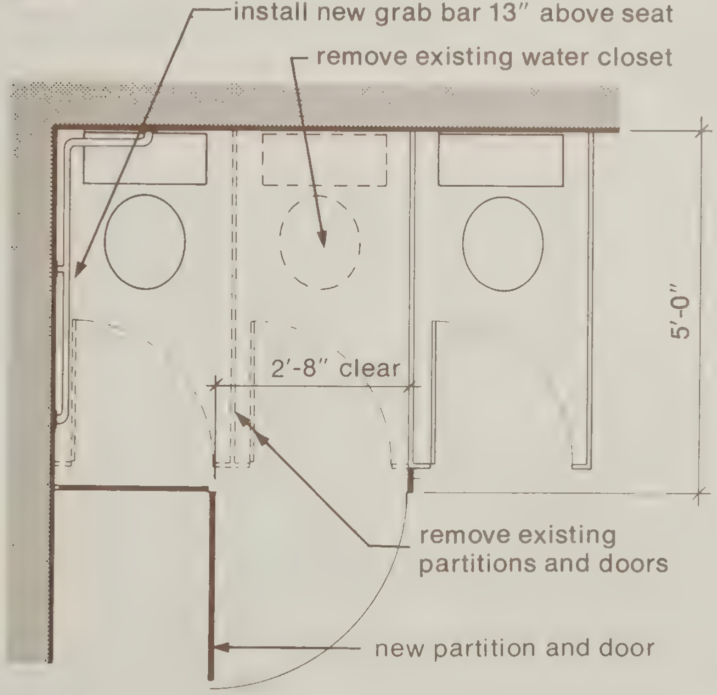


Backs chair in parallel to water closet. Removes arm rest on chair. With one hand on water closet seat, other on chair,

lifts and slides onto seat. Maintains balance by using grab bar and wheelchair.

PARALLEL TRANSFER




install new grab bar 13" above seat
remove existing water closet
5'-0"
2'-8" clear
remove existing partitions and doors
new partition and door

5'-0" X 5'-0" STALL

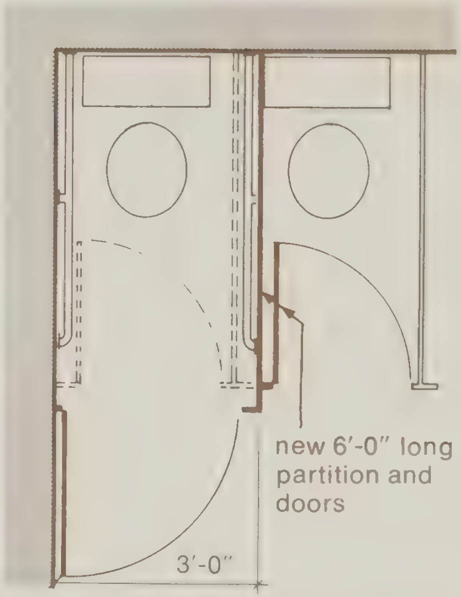
Standard toilet stalls in existing toilet rooms may be 2'-6" wide by 4'-8" or 5'-0" deep.

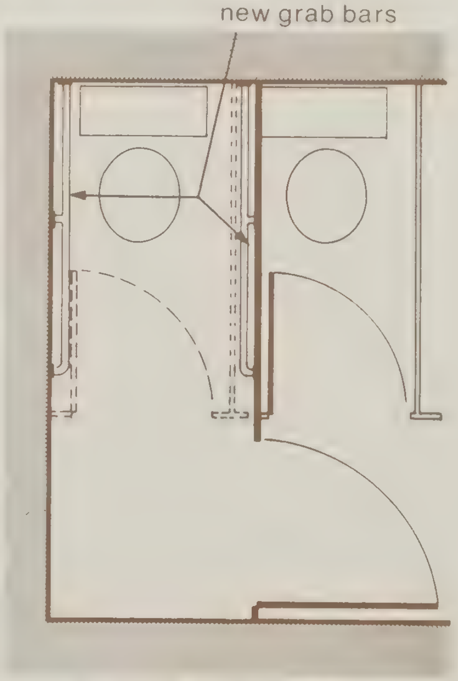
In such rooms with multiple fixtures, necessary 5'-0" × 5'-0" space for approach to water closet can easily be provided by removing one water closet and partitions as shown and installing one new partition panel with 2'-10" wide outswinging door and grab bar.

In toilet rooms where one water closet cannot be sacrificed or where space is extremely limited a 3'-0" × 6'-0" deep stall can be installed with two 4'-6" long grab bars. However this stall cannot be used by many handicapped people and will cost more due to necessity of two grab bars and more new partitions.

3'-0" width is essential for this type of stall and will not fit readily into existing group stalls which are usually 2'-6" wide.

Note: Other possible toilet room configurations are contained in the *Illustrated Handbook*.





3'-0" X 6'-0" STALL

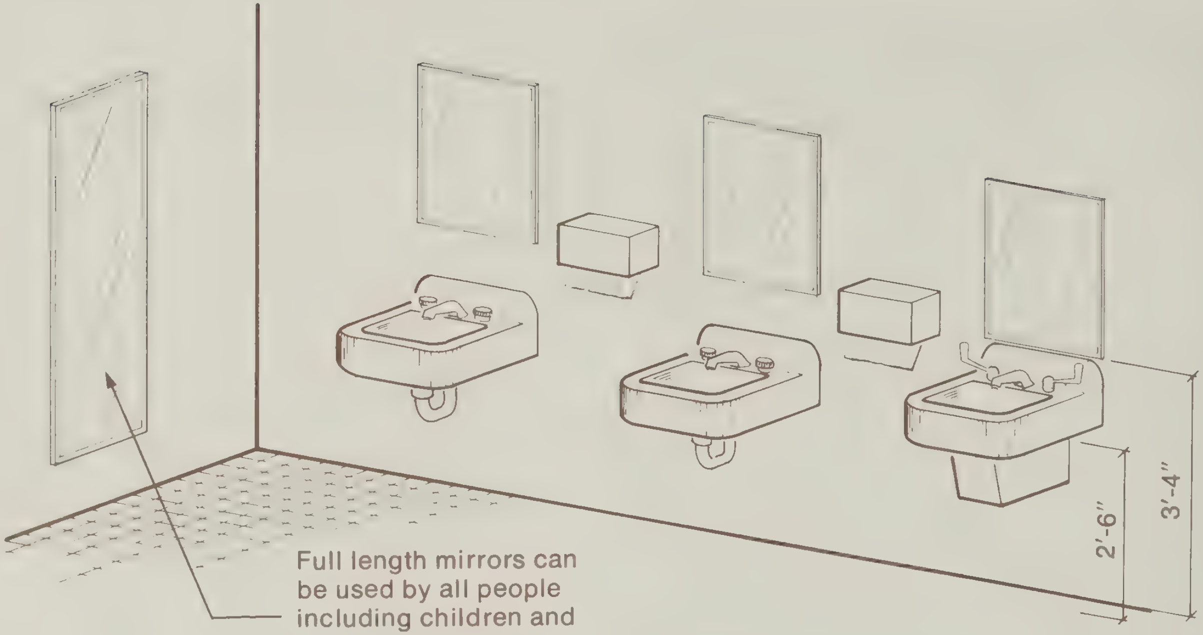
LAVATORY MODIFICATIONS

1. Lower mirror and dispensers to 3′-4″ above floor or install "tilt" mirror. See p. 45.

2. Raise lavatory to provide 2′-6″ $\boxed{*}$ clearance under skirt.

3. Lever- or blade-type handles of faucets can be used by persons who cannot grip round knobs or who have no hands.

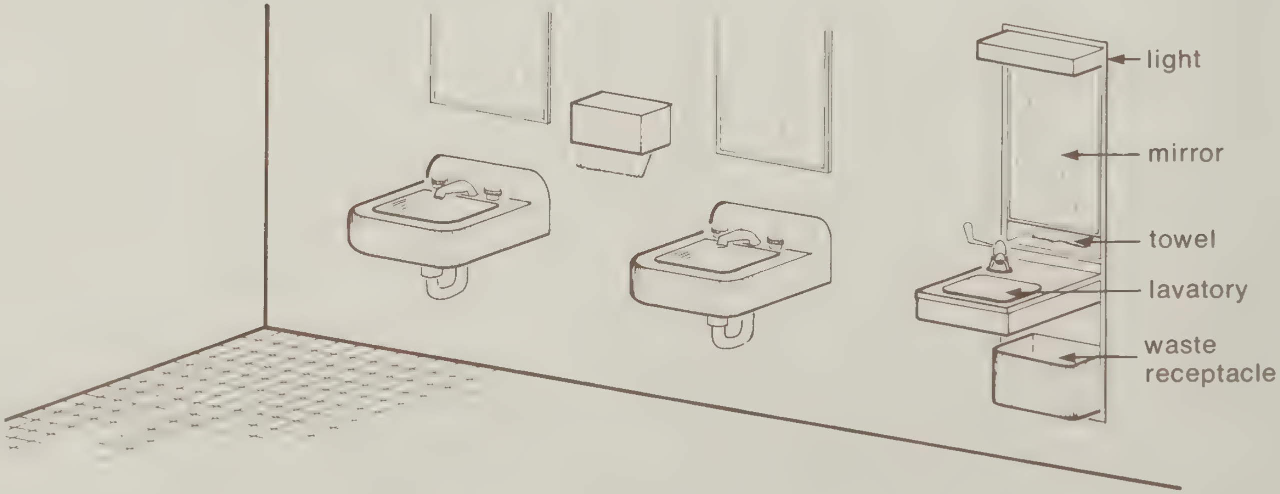
4. Cover piping with protective material or lower water temperature to 120° or less.



Full length mirrors can be used by all people including children and are much preferred.

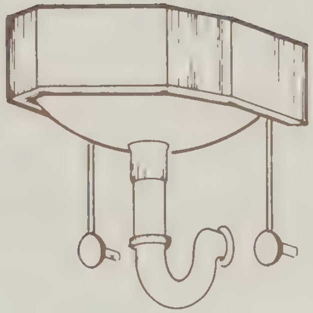
A unitized lavatory has been developed which can simply be bolted to the wall and provides usable light, mirror, soap dispenser, towel dispenser, lavatory controls, waste receptacle, and concealed plumbing.

This unit meets all building code requirements for handicapped lavatories in one economical, simple installation.

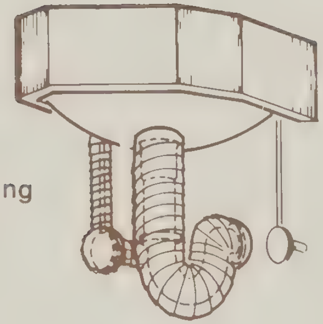


Persons with no sensation in their legs receive burns on the legs from exposed lavatory pipes which get too hot.

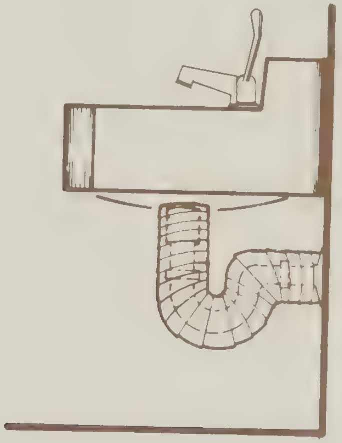
Such pipes must be insulated or enclosed, or water temperature reduced to 120° maximum.

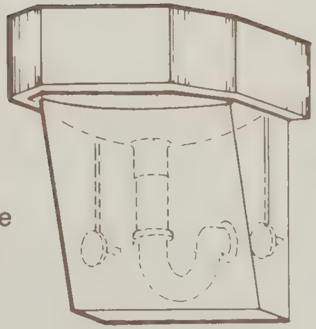


exposed piping

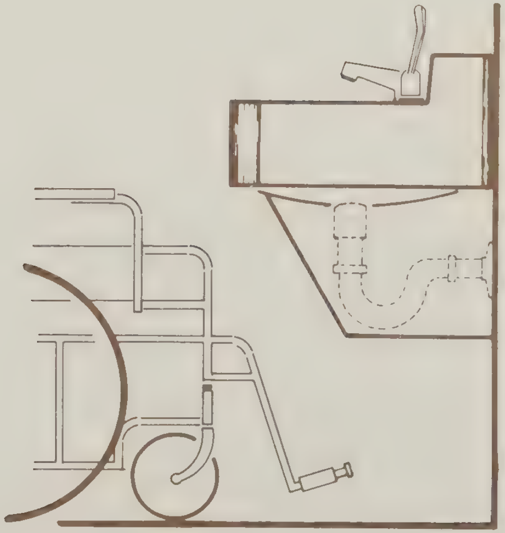


insulation and
protective wrapping

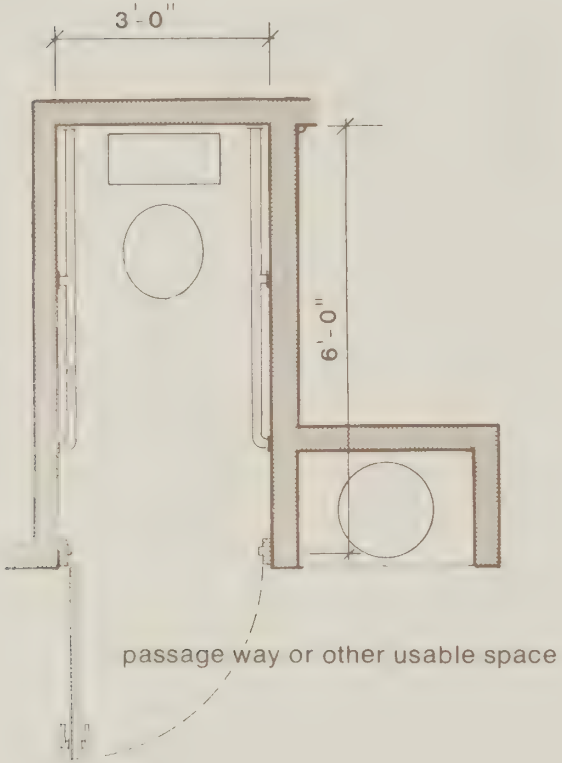




protective housing
of wood or other
material, removable
for access to pipes

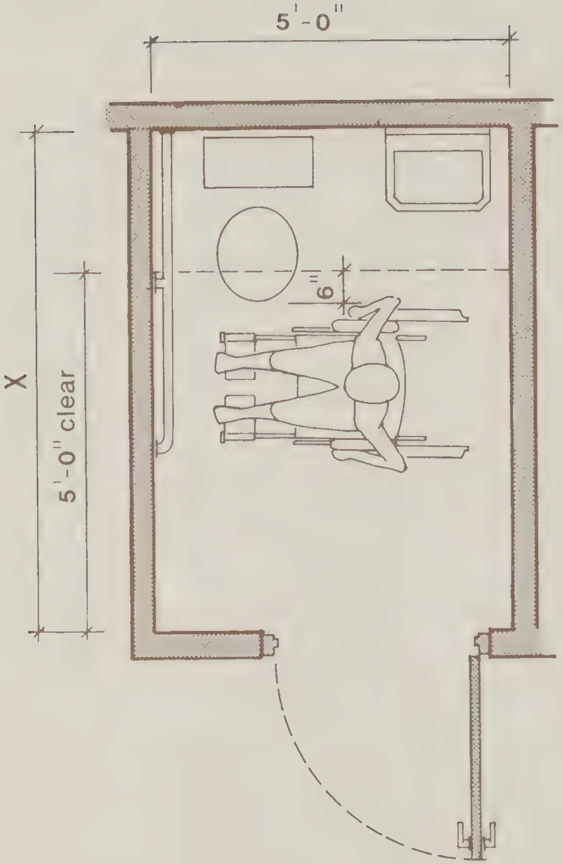


toilet rooms
small spaces



Where space is extremely limited and 5′-0″ X 5′-0″ space cannot be provided, a minimal 3′ X 6′ enclosed space as shown could provide limited but accessible toilet facilities.

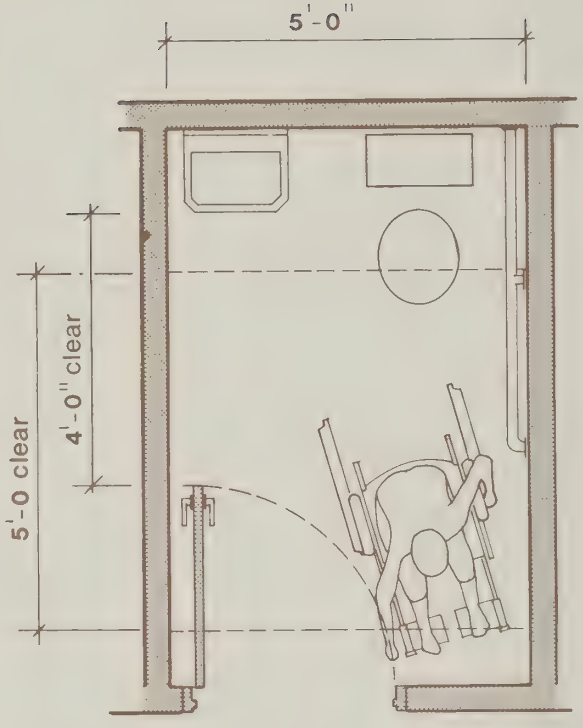
Door must swing out, lavatory must be located outside of enclosed space.



Minimum size toilet room with out-swinging door and 5′-0″ X 5′-0″ floor space. 6″ of floor space may be under front edge of water closet.

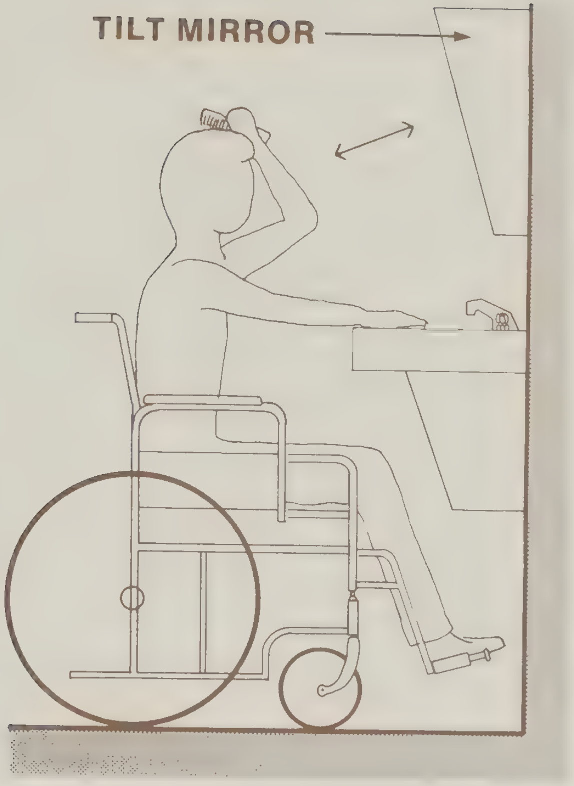
X = 5′-0″ + depth of water closet minus 6″.

Lavatories must be located as close as possible to side wall and must have 2′-6″ ⧆ clear space below skirt.



Minimum size toilet room with in-swinging door.

Door may overlap 5′-0″ X 5′-0″ floor space so long as there is at least 4′-0″ clear space beyond edge of door in its 90° position.

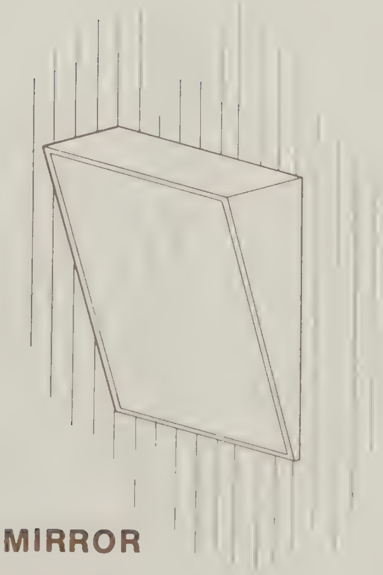


Where mirrors cannot be lowered to 3′-4″ above floor or where not desired, "tilt" mirrors can be installed at higher levels which will still accommodate seated people and children.

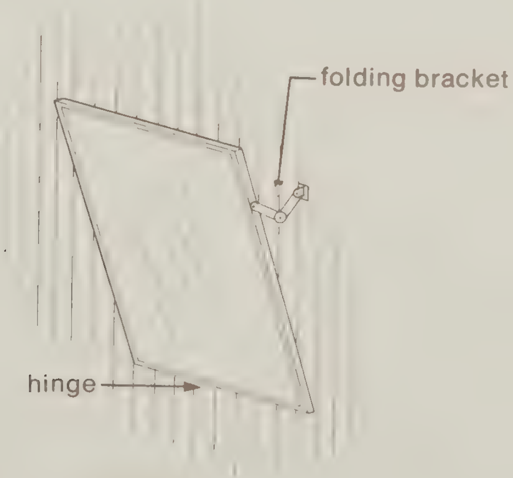
Full-length wall mirrors will accommodate everyone and are strongly recommended.

Tilt mirrors come in fixed angle models and adjustable tilt types.

The fixed models are inconvenient for standing people. The tilt models are adjustable for all but usually get left in vertical position and therefore are not usable by seated people who may not be able to reach up to tilt them or may not know they tilt.



FIXED TILT MIRROR



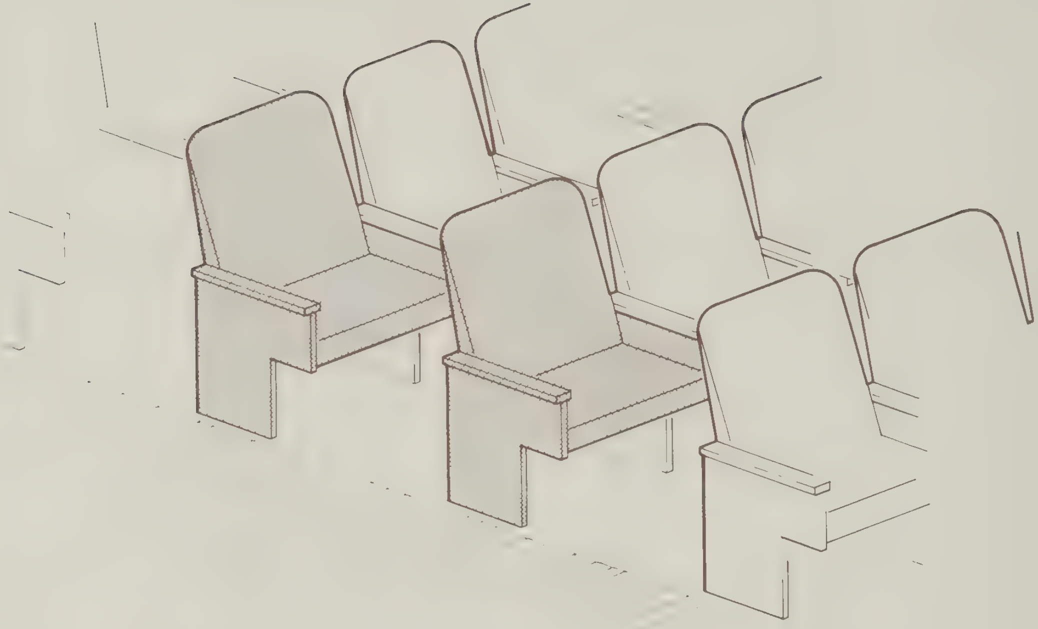
ADJUSTABLE TILT MIRROR

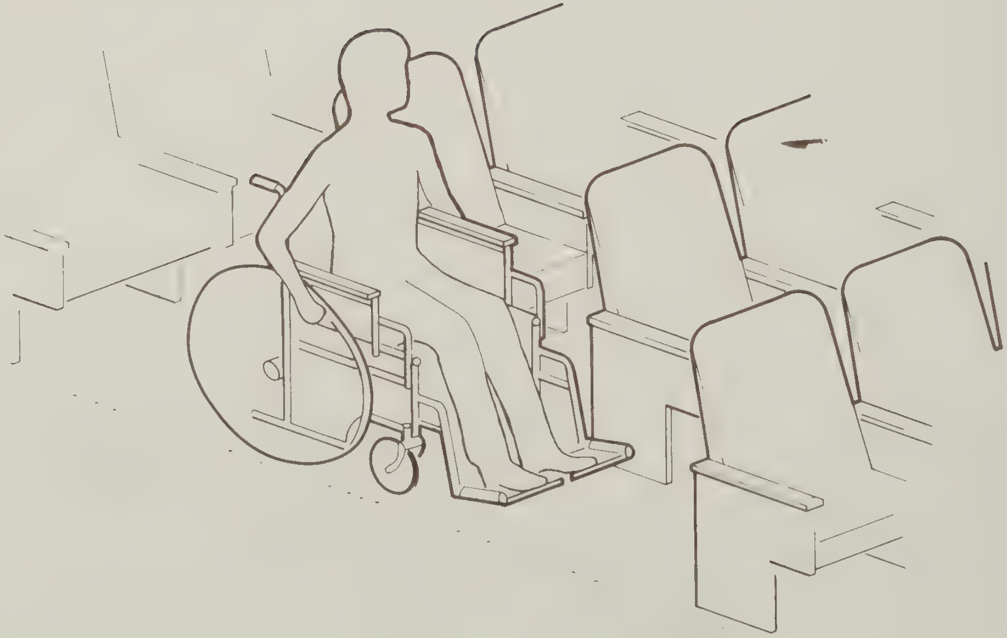
seating for assembly

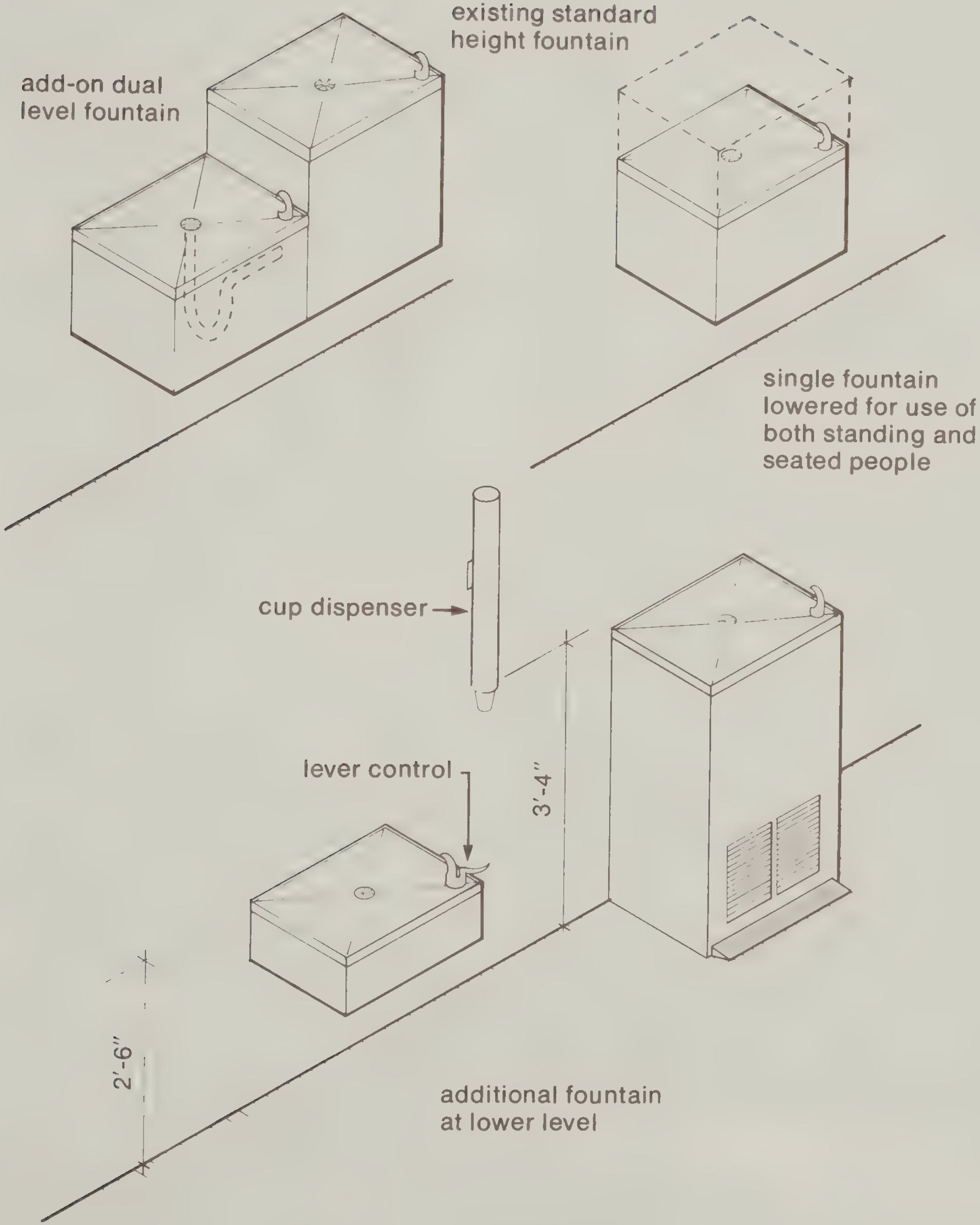
Fixed seating in places of assembly can be modified to accommodate the handicapped by removing two seats in each location to provide space for people with wheelchairs, walkers, and leg braces. See *Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code* for space requirements.

Portable seating with quick connect-disconnect floor mounts can be substituted if accessible spaces are not needed and capacity crowds occur.

Wherever possible, accessible seating should be provided in a variety of locations.






add-on dual level fountain
existing standard height fountain
single fountain lowered for use of both standing and seated people
cup dispenser
lever control
3'-4"
2'-6"
additional fountain at lower level

Existing water fountains are usually too high to be used by seated or short people.

Wall-mounted water fountains can be lowered but may require changing plumbing and patching of existing wall.

It may be possible to add a side-mounted fountain to an existing wall-hung fountain and tie new plumbing into the existing fountain without cutting into walls.

Water coolers with foot-operated controls cannot be used by many people. Lever handle controls can be used by most people.

In many cases it may be economically more practical to install a new water fountain than to relocate or modify an existing one.

Rim should be mounted 2′-6″ from floor. Control should be up front and lever operated.

If no modification to water fountains or coolers is planned, a paper cup dispenser is an inexpensive alternative which is of help to some people. Cup dispensers, however, are a continuing expense and maintenance problem.

Dispenser should be mounted with opening no higher than 3′-4″ above floor.

COST ANALYSIS

PRIORITIES

Costs and priorities for modifications can be difficult to determine because costs will vary widely depending upon type of construction, terrain, availability of materials, labor, etc., and priorities may be dependent upon many variables of building use and type.

Modifications are always more costly than new construction. It may not be economically possible to modify all of the necessary building elements to provide total accessibility, but many items require very little change and even these small changes can make a building more accessible and should not be overlooked because of the inability to correct all deficiencies.

There are so many variable factors to consider in establishing priorities for modifications that it is impossible to recommend a set of priorities which will apply to all building types. However, priorities should be established for each modification project although they may vary from one building to another and should be established for each on an individual basis considering building use, economics, administrative policy, number of floors, type of construction, etc.

Despite these variables there are certain obvious universal requirements which indicate the first priority to be:

1. ACCESS TO A BUILDING AND SITE CONSIDERATIONS: One must be able to approach and enter a building in order to make use of it.

Once inside the building the second priority would be :

2. MOVEMENT TO AND USE OF PRIMARY USE FACILITIES (classrooms, offices, laboratories,etc.): This may involve vertical circulation if primary use facilities are on more than one floor, or if the floor has changes in level.

Once the primary use facilities have been made accessible, the priority selection becomes more complex:

3. TOILET AND OTHER SUPPORT FACILITIES: These might be the third priority. However, modification of toilet facilities on accessible levels of a building may take precedence over modifications for vertical circulation depending on the nature and use of the facilities on other levels.

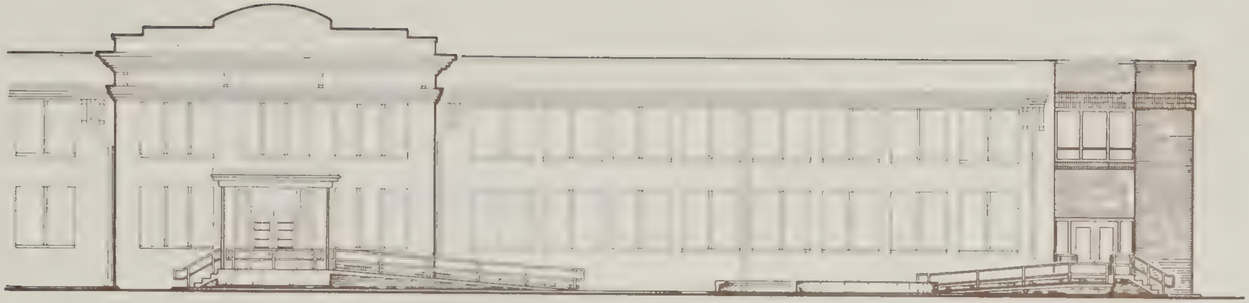
Beyond this point it is very difficult to establish precedence for modifications. Ideally, all spaces on all levels of a building and all toilet facilities should be made accessible.

ANALYSIS

The following pages provide illustrations and related actual costs for modification to the Vocational Rehabilitation Evaluation and Training Facility, Cherry Hospital, Goldsboro, North Carolina.

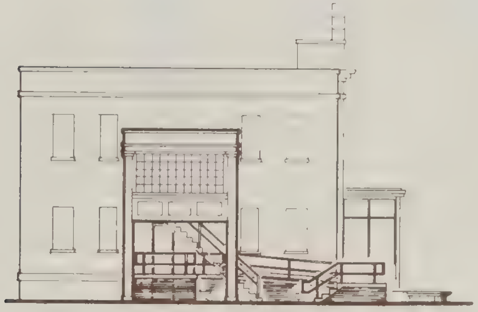
The building is a 40-year-old, two-story brick structure with metal joist floor construction and, although its present use is for services to the handicapped, it is almost totally inaccessible to handicapped people. The modifications necessary to provide accessibility include many of the problems and solutions discussed in this book.

The modifications are described and itemized and the costs shown are average bid prices received April 1, 1976, in eastern North Carolina.

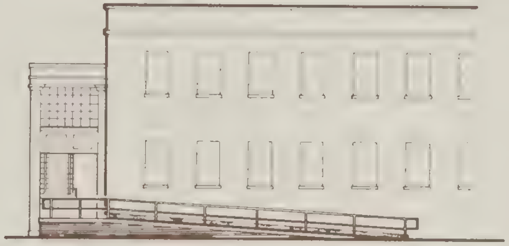


new elevator tower,
lobby, vestibules,
and approach ramps

elevation ①



elevation ②



split level vestibule
modification and
approach ramp

elevation ③

modifications to vocational rehabilitation facility
cherry hospital goldsboro, north carolina

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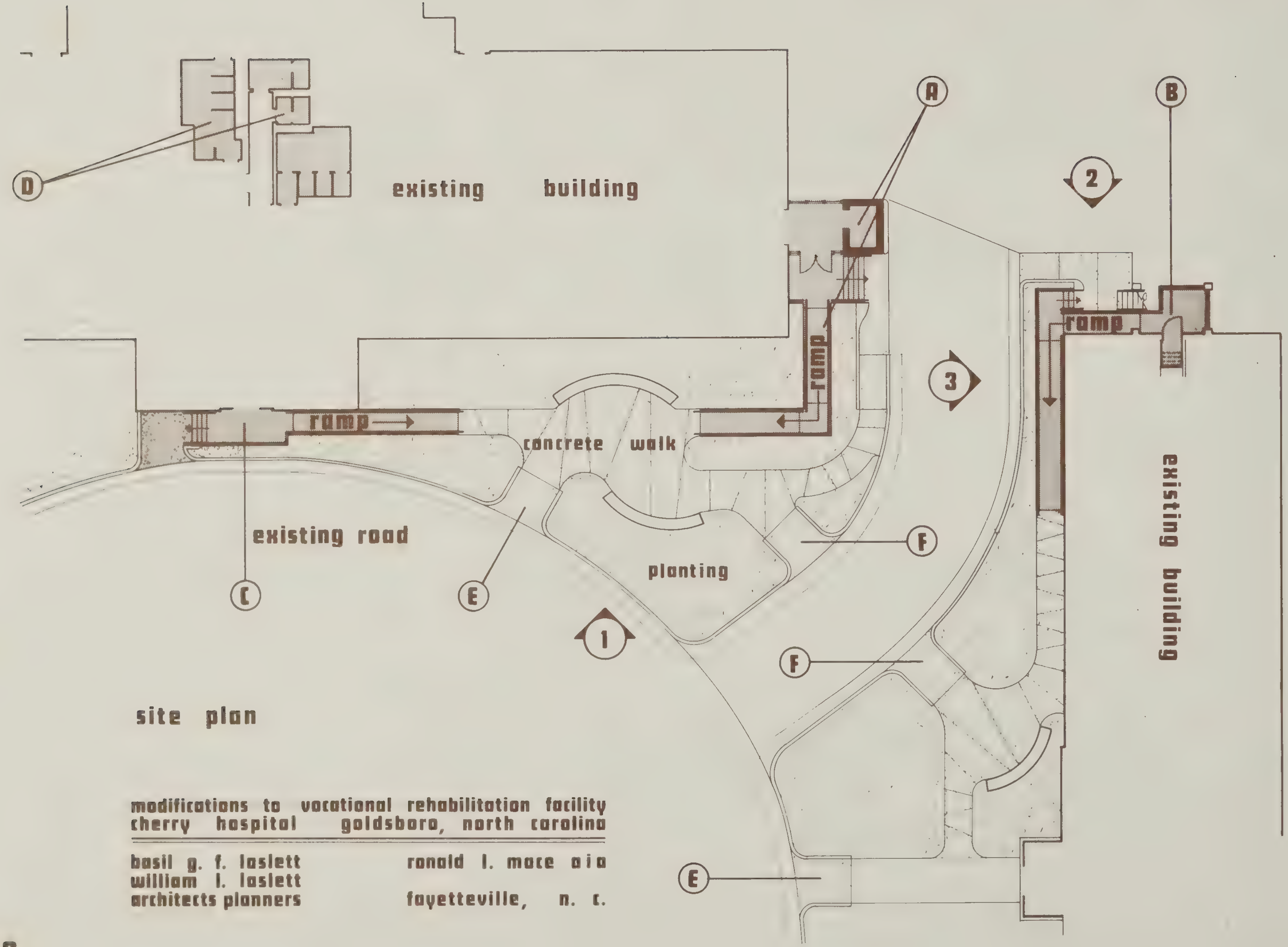
basil g. f. laslett
william l. laslett
architects planners

ronald l. mace a i a

fayetteville, n. c.



site plan

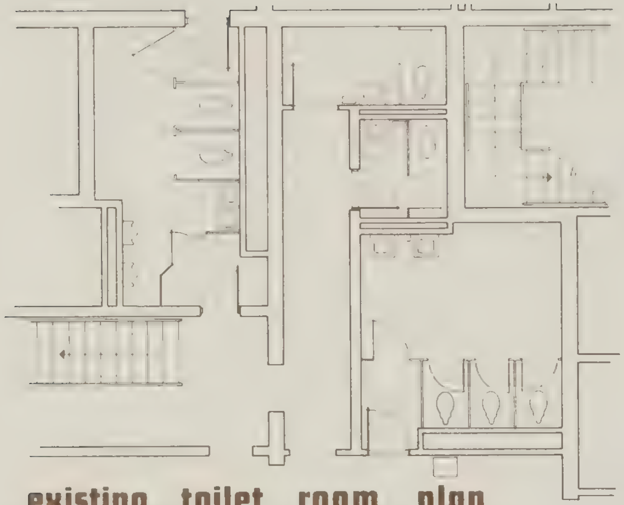
modifications to vocational rehabilitation facility
cherry hospital goldsboro, north carolina

basil g. f. laslett
william l. laslett
architects planners

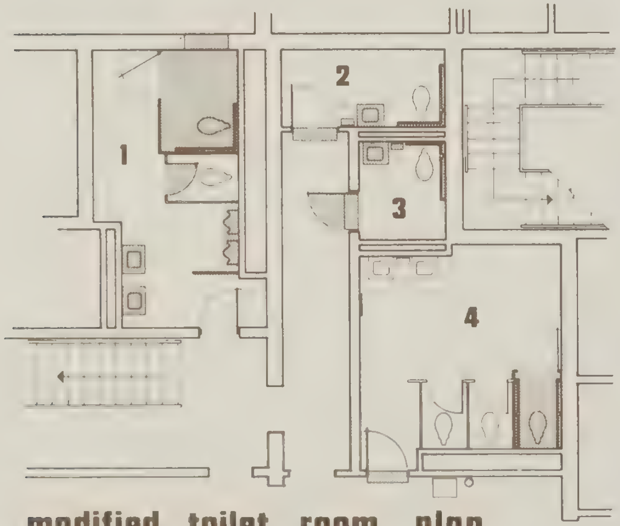
ronald l. mace a i a

fayetteville, n. c.

ITEM	DESCRIPTION	REFERENCE	BID PRICE, APRIL 1976 NOTE: Costs given here are for comparison and information only and should not be taken as accurate prices for other locations.
A	Two story elevator: hydraulic, two stops. Enclosing tower shaft and connecting bridge vestibules: brick, steel, and concrete construction. Aluminum doors and windows for vestibules.	See page 29.	$33,111.43
	L-shape concrete ramp at 1 in 15 slope, with steel handrails both sides.	See pp. 9, 13.	$5,956.00
	Includes all mechanical and electrical services and elevator equipment room.		
B	Split-level vestibule entrance: L-shape concrete ramp at 1 in 15 slope, rise 3.16 feet.	See page 12.	$7,100.00
	Steel handrails both sides.	See pp. 9, 13.	
C	New platform: raised 6″ to match floor level.		$5,912.00
	Straight run ramp at 1 in 15 slope, rise 2.10 feet.	See page 8.	
	New steps and landings.	See page 35.	
	Steel handrails both sides.		
D	Toilet room modifications: see detailed plans, descriptions and costs page 53.		
E	New curb cuts in existing curb.	See page 3.	$410.00
F	New curb cuts at new curb, sidewalk, and street.	See page 3.	$196.00



existing toilet room plan



modified toilet room plan

modifications to vocational rehabilitation facility
cherry hospital goldsboro, north carolina

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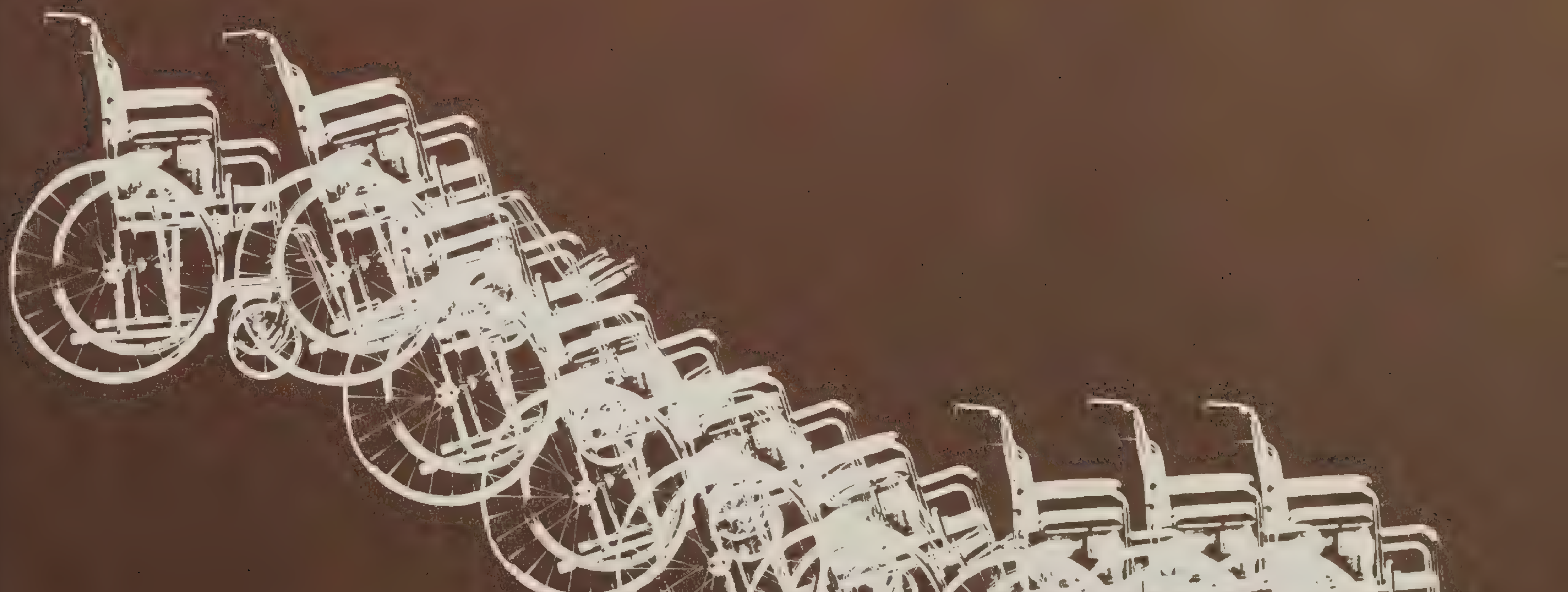
basil g. f. laslett
william l. laslett
architects planners

ronald l. mace aia
fayetteville, n. c.

ITEM	DESCRIPTION	REFERENCE	BID PRICE, APRIL 1976 NOTE: Costs given here are for comparison and information only and should not be taken as accurate prices for other locations.
D_1	Close existing door, install new partitions and grab bars for 5′-0″ X 5′-0″ stall.	See page 41.	$927.86
	Relocate urinals and install new unitized lavatories.	See page 42.	$3,350.00
D_2	Remove existing toilet stall partition. Lower existing mirror and towel dispenser. Install new grab bar. Remove and replace existing threshold with sloping one.	See page 42. See page 25.	$534.29
D_3	Same as D_2, except swing of existing door to swing out.		$510.00
D_4	Remove double entry door. Install new mirror. Extend existing 3′-0″ wide stall to 6′-0″ long and install new out swinging door and two grab bars.	See page 37. See page 42.	$642.86
	NOTE: Items D_2 & D_4 are repeated on second floor.		
DOOR WIDENING (NOT SHOWN)	Widen existing 2′-2″ door in metal frame at masonry wall to 3′-0″ door.	See page 18.	$361.67 Price does not include cost of new door



APPENDIX

appendix A-design specifications

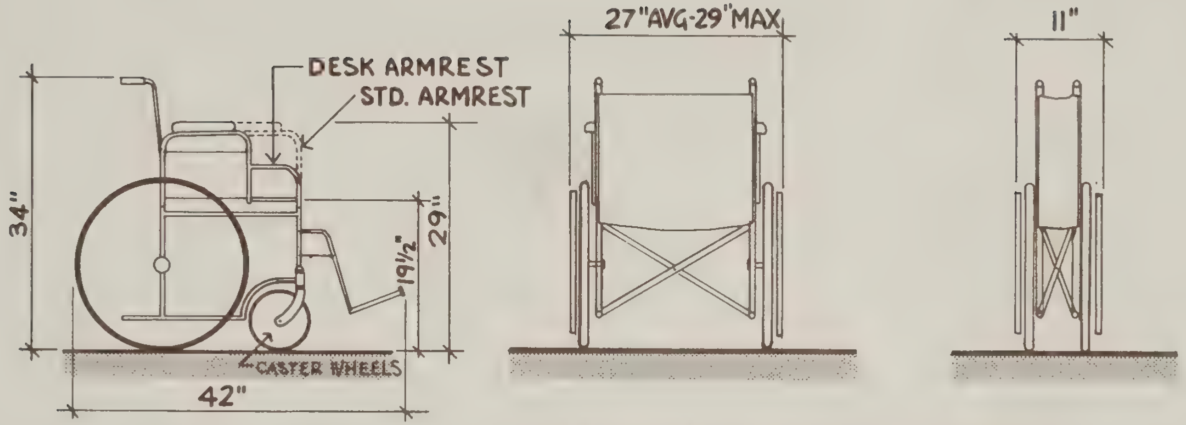
(1)—wheelchair specifications

The collapsible-model wheelchair of tublar metal construction with plastic upholstery for back and seat is most commonly used. The standard model of all manufacturers falls within the following limits, which were used as the basis of consideration.

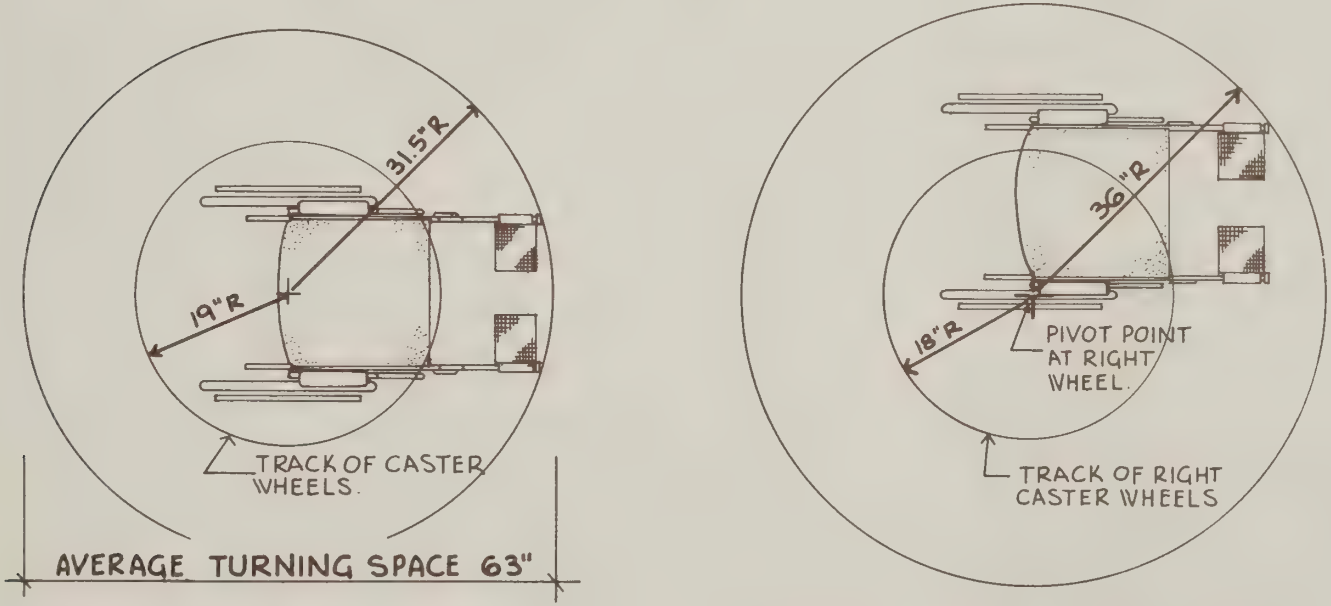
1) Length: 42 inches
2) Width, when open: 27 inches average, 29 inches maximum
3) Height of seat from floor: 19½ inches
4) Height of armrest from floor: 29 inches
5) Width, when collapsed: 11 inches

(2)—fixed turning radius, wheel to wheel

a) The fixed turning radius of a standard wheelchair, wheel to wheel, (the tracking of the caster wheels and large wheels of a wheelchair when pivoting on a spot) is 18 inches.



WHEELCHAIR DIMENSIONS


31.5"R
19"R
TRACK OF CASTER WHEELS.
AVERAGE TURNING SPACE 63"
36"R
18"R
PIVOT POINT AT RIGHT WHEEL.
TRACK OF RIGHT CASTER WHEELS

PIVOT POINT AT CENTER

USUAL TURNING METHOD - MOVING ONE WHEEL FORWARD & THE OTHER BACKWARD TO PIVOT ABOUT CENTER.

PIVOT POINT AT ONE WHEEL

ALTERNATE TURNING METHOD- LOCKING ONE WHEEL & TURNING THE OTHER.

TURNING RADII OF WHEELCHAIR

1) WHEELCHAIR SPECIFICATIONS:

THE MOST COMMON TYPE OF WHEELCHAIR USED BY NON-AMBULANT PERSONS OUTDOORS IS THE COLLAPSIBLE TUBULAR METAL CHAIR WITH PLASTIC OR NYLON UPHOLSTERY FOR SEATS & BACKS. TO SUIT NEEDS OF VARIOUS DISABILITIES THESE ARE AVAILABLE WITH NUMEROUS ATTACHMENTS & REMOVABLE PARTS SUCH AS LEG RESTS, ARM RESTS, TILT UP LEG RESTS, TILTING BACK RESTS, ETC. THE STANDARD BASIC CHAIR IS ILLUSTRATED ON THIS PAGE.

2.) FIXED TURNING RADIUS OF WHEELCHAIRS

(a) THE FIXED TURNING RADIUS OF WHEELCHAIRS, WHEEL TO WHEEL, WHEN PIVOTING ON A SPOT IS 18". I.E. DISTANCE FROM PIVOT SPOT TO TRACK OF CASTER WHEEL.

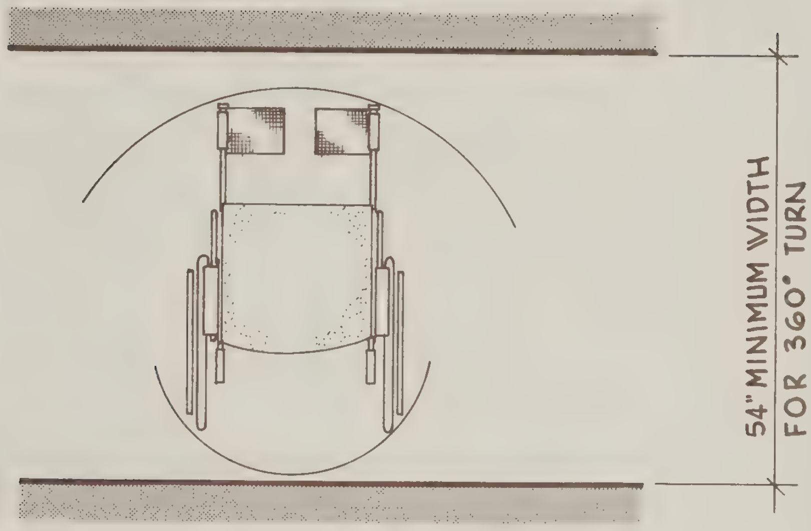
THE TURNING RADIUS OF WHEELCHAIRS FROM PIVOT POINT AT CENTER OF CHAIR TO FORMOST PROJECTION OF THE FOOTRESTS IS APPROXIMATELY 31.5"

appendix A

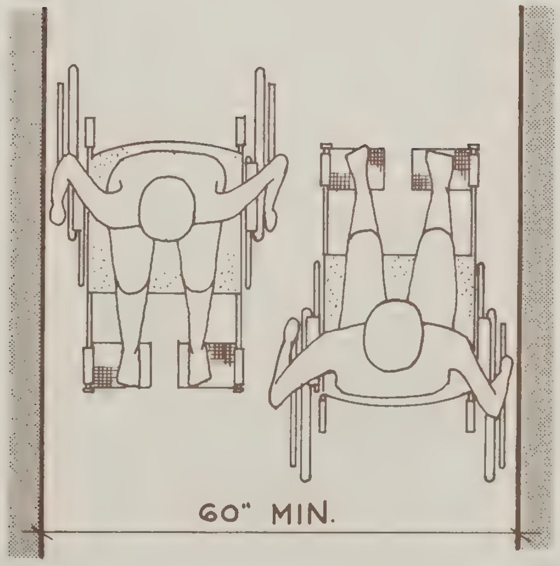
b) The fixed turning radius, front structure to rear structure, (the turning radius of a wheelchair, left front-foot platform to right rear wheel, or right front-foot platform to left rear wheel, when pivoting on a spot) is 36 inches. The average turning space required is 63 inches x 63 inches.

NOTE: Actually, a turning space that is longer than it is wide, specifically 63 by 56 inches, is more workable and desirable. In an area with two open ends, such as might be the case in a corridor, a minimum of 54 inches between two walls would permit a 360-degree turn.

c) A minimum width of 60 inches is required for two individuals in wheelchairs to pass each other.



(b.) THE FIXED TURNING RADIUS FROM PIVOT POINT AT RIGHT REAR WHEEL TO LEFT FRONT FOOTREST, OR FROM LEFT REAR WHEEL PIVOT POINT TO RIGHT FRONT FOOTREST, IS 36". THE AVERAGE TURNING SPACE REQUIRED IS 63"×63".



(c) A MINIMUM WIDTH OF 60" IS REQUIRED FOR TWO INDIVIDUALS IN WHEELCHAIRS TO PASS EACH OTHER.

appendix A

(3)—the individual functioning in a wheelchair

Extremely small, large, strong, or weak and involved individuals could fall outside the ranges of reach and their reach could vary. However, these reaches were determined using a large number of individuals who were functionally trained, with a wide range in individual size and involvement.

a) The average unilateral vertical reach is 60 inches and ranges from 54 inches to 78 inches.

b) The average horizontal working (table) reach is 30.8 inches and ranges from 28.5 inches to 33.2 inches.

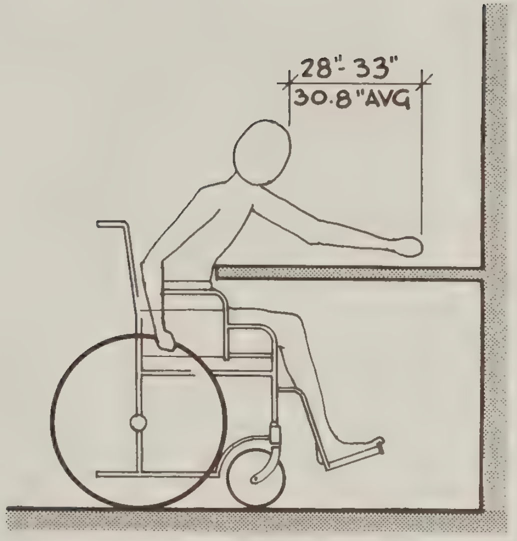
c) The bilateral horizontal reach, both arms extended to each side, shoulder high, ranges from 54 inches and averages 64.5 inches.

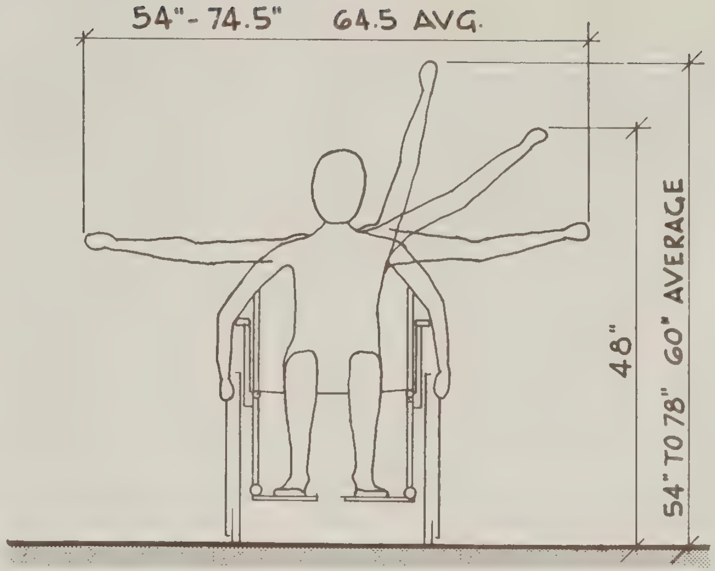
d) An individual reaching diagonally, as would be required in using a wall-mounted dial telephone or towel dispenser, would make the average reach (on the wall) 48 inches from the floor.

(4)—the individual functioning on crutches and walkers

Most individuals ambulating on braces or crutches, or both, or on canes are able to manipulate within the specifications prescribed for wheelchairs, although doors present quite a problem at times. However, attention is called to the fact that a crutch tip extending laterally from an individual is not obvious to others in heavily trafficked areas, certainly not as obvious or protective as a wheelchair and is, therefore, a source of vulnerability.

a) On the average, individuals 5 feet 6 inches tall require 31 inches between crutch tips in the normally accepted gaites. (b) On the average, individuals 6 feet tall require 32.5 inches between crutch tips in the normally accepted gaites.





3) THE INDIVIDUAL FUNCTIONING IN A WHEELCHAIR.

(a) THE AVERAGE UNILATERAL VERTICAL REACH IS 60".

(b) THE AVERAGE HORIZONTAL WORKING REACH IS 30.8".

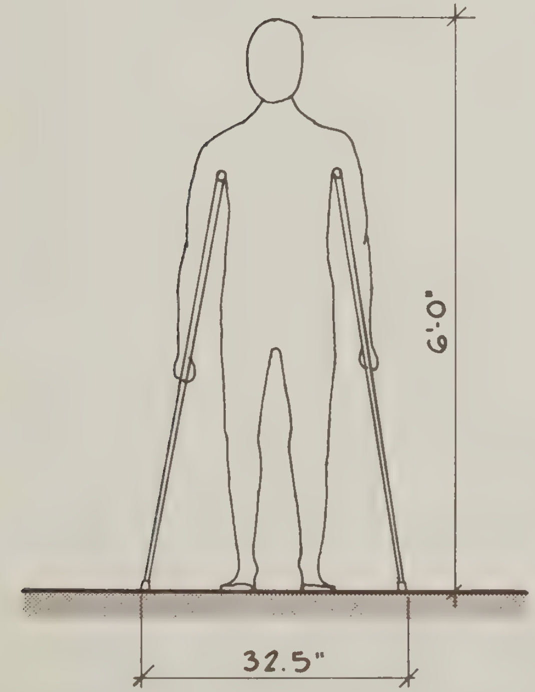
(c) THE BILATERAL HORIZONTAL REACH (BOTH ARMS EXTENDED TO SIDE SHOULDER HIGH) AVERAGES 64.5".

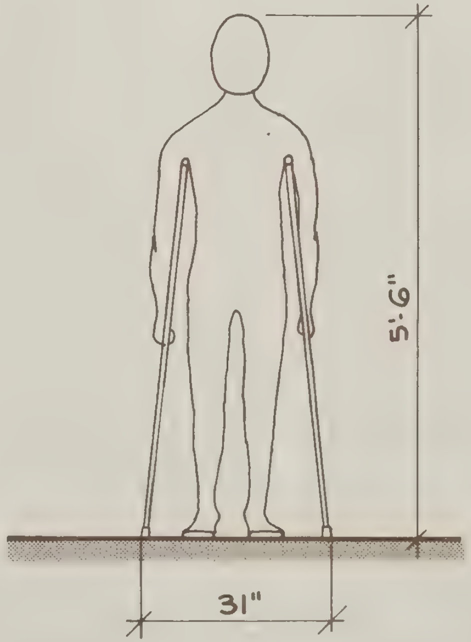
(d) THE DIAGONAL REACH, AS FOR WALL MOUNTED PHONE, IS 48" FROM THE FLOOR.

4) THE INDIVIDUAL FUNCTIONING ON CRUTCHES & WALKERS.

(a) INDIVIDUALS 5'-6" TALL REQUIRE 31" BETWEEN CRUTCH TIPS.

(b) INDIVIDUALS 6'-0" TALL REQUIRE 32.5" BETWEEN CRUTCH TIPS.





appendix B–
related handicapped legislation

1—An Act to Provide for Treatment of Handicapped and Disabled Persons Equal to that Afforded Other Persons N. C. General Statutes 168-1 through 168-8

ARTICLE 1.

Rights.

§ 168-1. **Purpose and definition.** — The State shall encourage and enable handicapped persons to participate fully in the social and economic life of the State and to engage in remunerative employment. The definition of "handicapped persons" shall include those individuals with physical, mental and visual disabilities. For the purposes of this Article the definition of "visually handicapped"in G.S. 111-11 shall apply. (1973, c. 493, s. 1.)

Editor's Note. — Session Laws 1973, c. 493, s. 3, makes the act effective July 1, 1973.

§ 168-2. **Right of access to and use of public places.** — Handicapped persons have the same right as the ablebodied to the full and free use of the streets, highways, sidewalks, walkways, public buildings, public facilities, and all other buildings and facilities, both publicly and privately owned, which serve the public. (1973, c. 493, s. 1.)

§ 168-3. **Right to use of public conveyances, accommodations, etc.** — The handicapped and physically disabled are entitled to accommodations, advantages, facilities, and privileges of all common carriers, airplanes, motor vehicles, railroad trains, motor buses, streetcars, boats, or any other public conveyances or modes of transportation; hotels, lodging places, places of public accommodation, amusement or resort to which the general public is invited, subject only to the conditions and limitations established by law and applicable alike to all persons. (1973, c. 493, s. 1.)

§ 168-4. **May be accompanied by guide dog.** — Every visually handicapped person shall have the right to be accompanied by a guide dog, especially trained for the purpose, in any of the places listed in G.S. 168-3 provided that he shall be liable for any damage done to the premises or facilities by such dog. (1973, c. 493, s. 1.)

§ 168-5. **Traffic and other rights of persons using certain canes.** — The driver of a vehicle approaching a visually handicapped pedestrian who is carrying a cane predominantly white or silver in color (with or without a red tip) or using a guide dog shall take all necessary precautions to avoid injury to such pedestrian. (1973, c. 493, s. 1.)

§ 168-6. **Right to employment.** — Handicapped persons shall be employed in the State service, the service of the political subdivisions of the State, in the public schools, and in all other employment, both public and private, on the same terms and conditions as the ablebodied, unless it is shown that the particular disability impairs the performance of the work involved. (1973, c. 493, s. 1.)

§ 168-7. **Guide dogs.** — Every visually handicapped person who has a guide dog, or who obtains a guide dog, shall be entitled to keep the guide dog on the premises leased, rented or used by such handicapped person. He shall not be required to pay extra compensation for such guide dog but shall be liable for any damage done to the premises by such a guide dog. (1973, c. 493, s. 1.)

§ 168-8. **Right to habilitation and rehabilitation services.** — Handicapped persons shall be entitled to such habilitation and rehabilitation services as available and needed for the development or restoration of their capabilities to the fullest extent possible. Such services shall include, but not be limited to, education, training, treatment and other services to provide for adequate food, clothing, housing and transportation during the course of education, training and treatment. Handicapped persons shall be entitled to these rights subject only to the conditions and limitations established by law and applicable alike to all persons. (1973, c. 493, s. 1.)

§168-9. **Right to housing.**—Each handicapped citizen shall have the same right as any other citizen to live and reside in residential communities, homes, and group homes, and no person or group of persons, including governmental bodies or political subdivisions of the State, shall be permitted, or have the authority, to prevent any handicapped citizen, on the basis of his or her handicap, from living and residing in residential communities, homes, and group homes on the same basis and conditions as any other citizen. Nothing herein shall be construed to conflict with provisions of Chapter 122 of the General Statutes. (1975, c. 635, s. 1.)

§ 168-9. **Right to Housing.**—Each handicapped citizen shall have the same right as any other citizen to live and reside in residential communities, homes, and group homes, and no person or group of persons, including governmental bodies or political subdivisions of the State, shall be permitted, or have the authority, to prevent any handicapped citizen, on the basis of his or her handicap, from living and residing in residential communities, homes, and group homes on the same basis and conditions as any other citizen. Nothing herein shall be construed to conflict with provisions of Chapter 122 of the General Statutes. (1975, c. 635, s. 1)

2—An Act to Prescribe Standards for Curb Ramps or Curb Cuts for Handicapped Persons

N. C. General Statutes 136-44.14

§ 136-44.14. Curb ramps or curb cuts for handicapped persons.

a) Curb constructed on each side of any street or road, where curbs and sidewalks are provided and at other major points of pedestrian flow, shall meet the following minimum requirements:

1) No less than two curb ramps or curb cuts shall be provided per lineal block, located at intersections.

2) In no case, shall the width of a curb ramp or curb cut be less than 40 inches.

3) The maximum gradient of such curb ramps or curb cuts shall be eight and thirty-three one-hundredths percent (8.33%) (12 inches slope for every one-inch rise) in relationship to the grade of the street or road.

4) One curb ramp or curb cut may be provided under special conditions between each radius point of a street turnout of an intersection, if adequate provisions are made to prevent vehicular traffic from encroaching on the ramp.

b) Minimum requirements for curb ramps or curb cuts under subsection (a) shall be met (i) in the initial construction of such curbs, and (ii) whenever such curbs are reconstructed, including, but not limited to, reconstruction for maintenance procedures and traffic operations, repair, or correction of utilities.

c) The Department of Transportation, Division of Highways, Design Section, is authorized and directed to develop guidelines to implement this Article in consultation with the Governor's Study Committee on Architectural Barriers (or the Committee on Barrier-Free Design of the Governor's Committee on Employment of the Handicapped if the Governor's Study Committee on Architectural Barriers ceases to exist). All curb ramps or curb cuts constructed or reconstructed in North Carolina shall conform to the guidelines of the Highway Design Section.

d) The Department of Transportation, Division of Highways, Highway Design Section, is authorized and directed to provide free copies of this Article together with implementary guidelines and standards, to municipal and county governments and public utilities operating within the State. (1973, c. 718, ss. 1-4.)

Editor's Note.—Session Laws 1973, c. 718, s. 5, makes the act effective Sept. 1, 1973.

3—An Act to Provide Tax Credits for Removal of Architectural Barriers to the Handicapped

N. C. General Statutes 105-130.5(a) (8), (b) (10), and (c) (24)

§ 105-130.5. Adjustments to federal taxable income in determining State net income.

a) The following additions to federal taxable income shall be made in determining State net income:

8) Depreciation or amortization claimed for federal income tax purposes in connection with facilities for the handicapped as such facilities are defined in subdivision (10) of subsection (b) of this section, provided the cost of such facilities has been previously deducted for State income tax purposes.

b) The following deductions from federal taxable income shall be made in determining State net income:

10) The entire amount of the cost of renovation to an existing building or facility owned by a taxpayer in order to permit physically handicapped persons to enter and leave such building or facility or to have effective use of the accommodations and facilities therein. The deduction shall be taken in the year the renovation is completed, and shall be made in lieu of any depreciation or amortization of the cost of such renovation. "Building or facility" shall mean only a building or facility, or such part thereof as is intended to be used, and is actually used, by the general public. If such building or facility is owned by more than one owner, the cost of renovation shall be apportioned among or between the owners as their interests may appear. The minimum renovation required in order to entitle a taxpayer to claim the deduction herein provided shall include one or more of the following: the provision of ground level or ramped entrances, free movement between public use areas, and washroom and toilet facilities accessible to and usable by physically handicapped persons.

c) The following other adjustments to federal taxable income shall be made determining State net income:

24) Deduction for Removal of Architectural Barriers to the Handicapped.—Any taxpayer who shall renovate an existing building or facility owned by such taxpayer in order to permit physically handicapped persons to enter and leave such building or facility, or to have effective use of the accommodations and facilities therein shall be allowed a deduction for the entire amount of the cost of such renovation. The deduction shall be allowable in the year the renovation is completed and shall be in

lieu of any depreciation or amortization of the cost of such renovation. "Building or facility" shall mean only a building or facility, or such part thereof as is intended to be used, and is actually used, by the general public. If such building or facility is owned by more than one owner, the cost of renovation shall be apportioned among or between the owners as their interests may appear. The minimum renovation required in order to entitle a taxpayer to claim the deduction herein provided shall include one or more of the following: the provision of ground level or ramped entrances, free movement between public use areas, and washroom and toilet facilities accessible to and usable by physically handicapped persons. (1939, c. 158, s. 322; 1941, c. 50, s. 5; 1943, c. 400, s. 4; c. 668; 1945, c. 708, s. 4; c. 752, s. 3; 1947, c. 501, s. 4; c. 894; 1949, c. 392, s. 3; 1951, c. 643, s. 4; c. 937, s. 4; 1953, c. 1031, s. 1; c. 1302, s. 4; 1955, c. 1100, s. 1; c. 1331, s. 1; cc. 1332, 1342; c. 1343, s. 1; 1957, c. 1340, ss. 4, 8; 1959, c. 1259, s. 4; 1961, c. 201, s. 1; c. 1148; 1963, c. 1169, s. 2; 1965, c. 1048; 1967, cc. 259, 550; c. 892, s. 6; c. 1110, s. 3; c. 1252, s. 2; 1969, cc. 725, 1082, 1123; c. 1175, s. 2; 1971, c. 1087, s. 2; c. 1206, s. 2.)

4—An Act to Amend the Income Tax Act to Provide a Credit Against Income Tax for the Construction of Dwelling Units Which Satisfy North Carolina Building Code Standards for Handicapped Living Units

House Bill 1224, ratified by General Assembly of North Carolina, 1973 Session (2nd Session, 1974)

The General Assembly of North Carolina enacts:

Section 1: Division I of Article 4, Subchapter I of Chapter 105 of the North Carolina General Statutes is hereby amended by adding a new section thereto to be designated as G. S. 105-130.22 and to read as follows:

§ 105-130.22 **Tax credit for construction of dwelling units for handicapped persons.** — There shall be allowed to corporate owners of multifamily rental units located in North Carolina as a credit against the tax imposed by this division, an amount equal to five hundred fifty dollars ($550.00) for each dwelling unit constructed by such corporate owner which conforms to the requirements of Section (11x) of the North Carolina Building Code for the taxable year within which the construction of such dwelling unit is completed; provided, that credit will be allowed under this section only for the number of such dwelling units completed during the taxable year which does not exceed five percent (5%) of the total of such units completed during the taxable year; provided further, that if the credit allowed by this section exceeds the tax imposed by this division reduced by all other credits allowed by the provisions of this division, such excess shall be allowed against the tax imposed by this division for the next succeeding year; and provided further, that in order to secure the credit allowed by this section the corporation shall file with its income tax return for the taxable year with respect to which such credit is to be claimed, a copy of the occupancy permit on the face of which there shall be recorded by the building inspector the number of units completed during the taxable year which conforms to Section (11x) of the North Carolina Building Code."

Section 2: Division II of Article 4, Subchapter I of Chapter 105 of the North Carolina General Statutes is hereby amended by adding a new section thereto to be designated as G. S. 105- 151.1 and to read as follows:

"§ 105-151.1. **Tax credit for construction of dwelling units for handicapped persons.** — There shall be allowed to resident owners of multifamily rental units located in North Carolina as a credit against the tax imposed by this division, an amount equal to five hundred fifty dollars ($550.00) for each dwelling unit constructed by such resident owner which conforms to the recommendations of Section (11X) of the North Carolina Building Code for the Taxable year within which the construction of such dwelling unit is completed; provided, that credit will be allowed under this section only for the number of such dwelling units completed during the taxable year which does not exceed five percent (5%) of the total of such units completed during the taxable year; provided further, that if the credit allowed by this section exceeds the tax imposed by this division reduced by all other credits allowed by the provisions of this division, such excess shall be allowed against the tax imposed by this division for the next succeeding year; and provided further, that in order to secure the credit allowed by this section the taxpayer shall file with his income tax return for the taxable year with respect to which such credit is to be claimed, a copy of the occupancy permit on the face of which there shall be recorded by the building inspector the number of units completed during the taxable year which conform to Section (11X) of the North Carolina Building Code."

Section 3. This act shall become effective for income years beginning on and after January 1, 1974.

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